SNF REPORT NO 09/08

An exploratory study of business model design and costumer value in heterogeneous network services

by
Per E. Pedersen
Leif B. Methlie
Herbjørn Nysveen

SNF project no 6255

"Designing business models for customer value in heterogeneous networks"

THE ECONOMICS OF MEDIA AND TELECOMMUNICATIONS

This report is one of a series of papers and reports published by the Institute for Research in Economics and Business Administration (SNF) as part of its telecommunications and media economics program. The main focus of the research program is to analyze the dynamics of the telecommunications and media sectors, and the connections between technology, products and business models. The project "Designing business models for customer value in heterogeneous networks" is funded by The Research Council of Norway.

INSTITUTE FOR RESEARCH IN ECONOMICS AND BUSINESS ADMINISTRATION
BERGEN, JUNE 2008

ISBN 978-82-491-0572-4 Printed version
ISBN 978-82-491-0573-1 Electronic version
ISSN 0803-4036

PREFACE

This report presents the results of an exploratory study of two service areas believed to represent important issues in the design of business models and the assessments of customer value in heterogeneous network services. The two areas have been selected in a previously published SNF-report (02/07), and constitute the areas Mobile VoIP and Multi play/Triple play services. The report is written as a deliverable of the SNF-project 6255, Debussy – "Designing Business Models for Customer Value in Heterogeneous Network Services". The report is written by Per E. Pedersen with Leif B. Methlie and Herbjørn Nysveen being responsible for chapter 3 and Herbjørn Nysveen contributing significantly to chapter 4. Valuable inputs have been provided by the project industry partners being Telenor ASA, Devoteam, Agder Energi and the Norwegian Post and Telecommunications Authority.

Bergen and Grimstad, June 2008

Per E. Pedersen, Leif B. Methlie and Herbjørn Nysveen

CONTENTS

ABSTRACT

This report presents the methodology and results of two studies of business model design and end-user value of heterogeneous network services. The two services investigated are Mobile VoIP and Triple play services. These service areas are carefully selected in a pre-study for being interesting as recently commercialized extensions of homogeneous network services.

Business model design is studied through qualitative interviews of 12 providers of the two services. End-user value assessments and intentions to adopt the services are studied through a quasi-experimental study of the effects of alternative value proposition designs.

The results of the business model design studies show few examples of radical innovations in business model design. Instead, business models designs similar to those found in homogeneous network services are applied. Structural conditions and end-user behaviour are perceived to influence business model design in heterogeneous network services in ways similar to those of homogeneous network services. Also, the business model design dimensions of two services investigated have relatively little in common that can be attributed to heterogeneous network characteristics. The results of the end-user studies show that value and intention to adopt the services is driven by well known value drivers, such as usefulness, norms and behavioural control. The perceived value of the two services is not particularly high when compared to previous studies of homogeneous network services. This suggests traditional consumers will not be sources of innovation in heterogeneous network services business models.

The findings have implications for business model designers, policy makers and further research. For business model designers, particular attention should be directed at the paradoxes of value proposition design identified here. It seems that service attributes easily influenced by business model design are not those most significantly influencing end-user value, and vice versa. For policy makers attention should be directed at the effects of regulatory policy, technological standardization and market conditions on innovation rather than competition. It seems that current structural conditions do not sufficiently stimulate business model innovation in heterogeneous network services. Further research may also be suggested from this study. In particular, more service comparisons are recommended based on both the method applied in the business model design study as well as the method developed to investigate value proposition design effects on end-users' value assessments.

LIST OF ABBREVIATIONS

3G	-	Third-generation Technology
3GPP	-	3rd Generation Partnership Project
4G	-	Fourth-generation Technology
ALG	-	Application Layer Gateway
ARPU	-	Average Revenue Per User
AMR	-	Automated Meter Reading
B3G	-	Beyond Third-generation Technology
CPA	-	Content Provider Access
CRM	-	Customer Relationship Management
DECT	-	Digital Enhanced Cordless Telecommunications
DSL	-	Digital Subscriber Line
DVB-H	-	Digital Video Broadcasting - Handheld
EDGE	-	Enhanced Data rates for Global Evolution
EPG	-	Electronic Program Guide
ETSI	-	European Telecommunications Standards Institute
FCC	-	Federal Communications Commission
FMC	-	Fixed-Mobile Convergence
FTTH	-	Fiber To The Home
GPRS	-	General Packet Radio Service
GAN	-	Generic Access Network
GPS	-	Global Positioning System
GSM	-	Global System for Mobile Communications
HSDPA	-	High Speed Downlink Packet Access
HTML	-	HyperText Markup Language
HTTP	-	Hypertext Transfer Protocol
IAX	-	Inter-Asterisk eXchange
ICT	-	Information and Communication Technology
IETF	-	Internet Engineering Task Force
IMS	-	IP Multimedia Subsystem
IP	-	Internet Protocol
IPTV	-	Internet Protocol Television
IRAP	-	International Roaming Access Protocols
J2EE	-	Java 2 Platform, Enterprise Edition
LAN	-	Local Area Network
LTE	-	Long Term Evolution
M2M	-	Machine to Machine
MMS	-	Multimedia Messaging Service
MVNO	-	Mobile Virtual Network Operator

NAT	-	Network Address Translation
NES	-	Networked Energy Services
NGN	-	Next Generation Networks/Networking
NPT	-	Norwegian Post and Telecommunications Authority
NTV	-	Norges Televisjon
OTA	-	Over-The-Air
PBX	-	Private Branch eXchange
PDA	-	Personal Digital Assistant
PSTN	-	Public Switched Telephone Network
QoS	-	Quality of Service
RAN	-	Radio Access Network
RFID	-	Radio Frequency Identification
SCP	-	Structure Conduct Performance
SER	-	SIP Express Router
SIA	-	Securities Industry Association
SIM	-	Subscriber Identity Module
SIP	-	Session Initiation Protocol
SMS	-	Short Message Service
SONA	-	Service Oriented Network Architecture
STUN	-	Simple Traversal of UDP through NATs
UDP	-	User Datagram Protocol
UMA	-	Unlicensed Mobile Access
UMTS	-	Universal Mobile Telecommunications System
URL	-	Uniform Resource Locator
VCC	-	Voice Call Continuity
VoIP	-	Voice over IP
VPN	-	Virtual Private Network
WAN	-	Wide area network
WLAN	-	Wireless LAN
WiFi	-	WLAN Technology based on IEEE 802.11
WiMAX	-	Worldwide Interoperability for Microwave Access
WPA	-	Wi-Fi Protected Access
WSN	-	Wireless Sensor Network
XML	-	Extensible Markup Language

1 INTRODUCTION

Next generation networks are expected to utilize a wide range of current and future heterogeneous access networks and provide end-users with new services offered across these networks (e.g. Tachikawa, 2003, Hui and Young, 2003). So far, we have seen few examples of these networks on the access side whereas providers have made heavy investments in heterogeneous infrastructures on the transport and backbone side. Heterogeneous networks are proposed to result in heterogeneous network services on the access side of the network which are believed to offer new value propositions characterized by seamlessness, service convergence and reduced prices to end-users.

This report presents the results of a series of empirical studies on structural conditions, business model designs and customer behavior on the access side of the heterogeneous network equation. It focuses the empirical results from these studies rather than theoretical elaboration, and thus, the report is exploratory in its approach. It presents the thoughts of managers and professionals representing service providers positioned in the heterogeneous service markets for two particular services – Mobile VoIP and Multi play/Triple play services. In addition, it presents the results of innovative studies of end-users' value assessments of these services addressing the problem of how to capture ordinary end-users' value assessments of services that they currently have no experience with. The results from these studies may be utilized by designers of regulatory policies for heterogeneous network services, by providers of such services and by researchers addressing the problem areas of business model design and end-user behaviour in innovative services – service innovation.

1.1 Background

Heterogeneity generally means something is composed of different components instead of similar components. Thus, a heterogeneous network connects different components and allows interoperability of these components. Interoperability, however, may be obtained by bridging differences or by creating homogeneity of components. By using the term heterogeneous network we mean to imply that components remain different, while interoperability is obtained by diverse forms of bridging. Interoperability is also a more general term used to describe connections among people, data and diverse systems, whereas heterogeneity is used to retain the focus on technological differences as the source of heterogeneity. The most traditional source of heterogeneity is heterogeneous access networks.

For Mobile VoIP, for example, the situation is characterized by an existing infrastructure of cellular access networks being challenged by service provisioning over a new access network, typically WiFi-networks. This situation creates uncertainty among traditional providers of cellular based services and new opportunities for greenfield providers utilizing the alternative access network. When seen from the end-user perspective, seamless integration across access networks is preferred. The example also illustrates two other important issues of heterogeneity. First, it illustrates how networks become capable of providing the same services, a situation typically described as network convergence. While convergence describes a development, heterogeneity is used to describe a state on the way towards convergence. Second, it illustrates how the state of heterogeneity creates uncertainty in the structural conditions of established providers and creates opportunities for new players and providers.

For Multi play services the situation is somewhat different with new providers offering access networks with enough capacity (e.g. FTTH) to deliver a multitude of services traditionally offered through a number of homogeneous networks. Thus, services are heterogeneous, whereas the network that is used to provide them is homogeneous. Here, the challenge is how to offer unique value from integration of services rather than seamlessness across networks. Also, cost advantages from utilizing this infrastructure can be reflected in pricing of services, particularly if services traditionally being offered as separate services are sold in bundles. Seamlessness and complete interoperability are often believed to be preferred by end-users, but well established end-user habits associated with services distributed over specific access and service networks represent behavioural inertia on the way towards convergence of the same kind as those of heterogeneity described above.

To address some of these issues, a project called "Debussy – Designing Business Models for Heterogeneous Network Services" was established. The project is funded by The Research Council of Norway and several industry partners, including Telenor, Devoteam, Agder Energi and The Norwegian Post- and Telecommunications Authorities. The project is included in the Verdikt program of The Research Council of Norway, which in 2006 announced a Call for projects focusing particularly on heterogeneous network issues.

1.2 Problems addressed

Whereas heterogeneous networks accentuates a range of technological as well as behavioural issues, the problems addressed in the Debussy-project focus business strategic behaviour of service providers in heterogeneous network contexts that tries to optimize their business model designs under two constraints. One is the structural constraints stemming from technological, market-related and regulatory

conditions for their business strategic behaviour. The other stems from the need to optimize their business model design to generate customer value and make their services adopted by end-users. A brief review of some of the problems related to this optimization problem is given below.

1.2.1 Structural issues

Even though the choice of business model is a strategic decision, the options are constrained by the structural conditions of the individual service providers as well as the general industry infrastructure. Methlie and Pedersen (2002) suggested five types of structural conditions: Market, Actor, Product, Influence, and Transaction. The Market type includes two main factors, fragmentation of players on the supply and demand side, and knowledge/competencies required to serve in a specific market. The Actor type includes measures on scale and scope economics, and cost variables. The Product type defines the content of a transaction and is measured by the degree of differentiation potential and the complexity of the service. The Influence and Transaction types define the exchange, where influence measures the social mechanisms, and transaction refers to the economical conditions that impact on the relationships. For heterogeneous network services, the five types of conditions may be delimited to three particularly important structural conditions for business model design: Market, regulation and technology (Pedersen et al., 2007). The market conditions correspond to the market type condition discussed above. Example of a problems related to this structural condition are how the fragmentation of market players influences the adoption of particular business model options, such as the choice of hierarchical versus relational governance forms. Established power relationships may also influence dominant players' willingness to redistribute revenue and adopt the new revenue models proposed by heterogeneous network provisioning, charging and billing standards. Different

service areas may be characterized by different levels of market fragmentation and some service areas may be dominated by powerful actors and comparisons of service areas may reveal how market conditions influence business model designs, in particular revenue models and governance forms. To be even more concrete, Pedersen et al. (2007) suggested that business models in the Mobile VoIP service area were particularly influenced by great fragmentation of the new and challenging Mobile VoIP providers and heavy consolidation among incumbent mobile operators. The lack of coordinated and powerful Mobile VoIP providers may hinder the development of innovative business model designs for Mobile VoIP services and delay the adoption of these services.

Technology is another structural condition particularly relevant to the design of business models for heterogeneous network services. In the framework discussed above, the presence or lack of technological standards is believed to be of particular importance. For example, in the area of Mobile VoIP services some standards, such as UMA, may be preferred by providers in the defending position that have already made heavy investments in homogeneous network infrastructure. SIP-based standards may on the other hand be preferred by service providers trying to utilize the heterogeneity of available access networks to develop and offer new services, such as Mobile VoIP. Preliminary analyses conducted as part of our pre-study (Pedersen et al., 2007) revealed that at least in Norway, the largest incumbent mobile operator had withdrawn from participation in many of the traditional standardization organizations. Lack of standardization through standardization institutions may be seen as a way to transfer standardization into de-facto standardization through market power, something that may restrict the development of innovative business models and end-user services in heterogeneous networks.

The third structural condition that is particularly important to heterogeneous network services is regulation. Typically, regulatory policies have developed over several years of defining relevant markets. In principle, relevant markets should be defined in a technology neutral way, but in practice almost all relevant market definitions covers homogeneous network markets where one specific network technology is used for access or transport. Thus, innovation in heterogeneous network services business models may be hindered by regulatory policies developed to ensure fair competition in homogeneous service markets. For example, significant market power providers in Norway are enforced to show transparency in all service bundles limiting their opportunity to freely optimize bundled Triple play offerings to customer preferences. On the other hand, regulation of homogeneous network markets may create windows of opportunities for designing innovative business models that at least temporarily utilizes "loopholes" in existing regulation. For example, the slow pace at which termination fee regimes change due to requirements of competitive stability and predictability of existing providers might be used by innovative Mobile VoIP providers that in practice may terminate calls at no marginal cost may at the same time invoice calling operators a significant termination fee if they could negotiate shares of termination fees (which under current regulation is difficult). Such windows of opportunity only seldom provide sustained competitive advantage, but due to differences in cost structures across heterogeneous networks, they may represent the necessary profit potential to attract innovative providers and designers of innovative business models. Also, regulatory policies on interworking, standardization and definition of relevant markets may affect which forms of vertical and hierarchical governance firms will be allowed to enter into. Thus, these structural conditions represent constraints on the way service providers are allowed to design their business models.

1.2.2 Business model issues

The term *business model* has gained considerable popularity recent years. Osterwalder et al. (2005b) show how the number of publications using the term correlates with NASDAQ fluctuations. This indicates that it has developed as a term used to describe how business is conducted in technology intensive sectors like ICT and telecommunications, and in particular in Internet-based firms of this sector. Whereas business model components are defined at the ontological level, typologies are created at the theory level, and examples of successful and less successful business models may be observed at the empirical level, surprisingly little empirical research has been conducted on what determines the design of business models of particular types and what effects business model decisions have. Thus, the business model literature is mainly descriptive in its attempt to categorize business models and is practicing a form of normative "design science" suggesting how business models should be designed without actually having any empirical basis for these normative recommendations. Business model decisions will always have to be made by provider management. Research, however, may provide theoretical and empirically tested knowledge supporting these decisions.

Business model design includes strategic choices to obtain competitive advantage. Competitive advantage can be obtained by cost leadership or by creating service attributes that differentiate a provider from other providers. Thus, business model designs should be reflected in the service attributes of the services offered.

As shown by Brousseau and Quelin (1996), communication services benefit from network size, and it is well known that the roaming and interconnect agreements among providers are made to increase network size and take advantage of the direct

network effects valued by end-users of these services. For providers of services characterized by complement network attributes, vertical forms of governance may be of more interest than horizontal forms like roaming agreements. Literature on governance forms in network markets as well as resource based theory suggests that complements service variety and diversity are better obtained using open forms of innovation (e.g. Schilling, 2003). Zahra and Nielsen (2002) found that relational forms increase development speed. In addition, when involvement and formal coordination are included as moderators, market governance also increases development speed.

Service quality on the other hand, may come out of the service integrator's control, or service quality may be unsatisfactory if control is left to market or relational governance (Dyer and Singh, 1998; Ghosh and John, 1999, p. 137). Thus, for services where intrinsic attributes are of particular importance to end-user value, providers may be reluctant to use market or relational governance, such as open innovation to develop new services in heterogeneous access networks (e.g. Koutsopoulou et al., 2004).

Development speed, complements network variety and unique, value driving intrinsic attributes require access to specialized resources. Transaction cost theory suggests that gaining control over specialized resources increases transaction cost (Williamson, 1985). Network infrastructure of different access networks may represent such resources, increasing the transaction costs of providing services in these networks. Resource based theory suggests resource alignment affects performance, such as innovation costs and partner conflict levels (Das and Teng, 2000). Services provided over heterogeneous access networks require resource alignment – increasing both transaction and *innovation* costs. Control of such costs

may only be obtained by appropriate business model design. These are all issues of relevance to business model design in heterogeneous network services. An important topic is if these issues are part of the considerations made by service providers of heterogeneous network services and if such business model designs considerations affect service attributes. For example, to stimulate complements network variety, revenue sharing may be used in business model design, but it is not always obvious how this contributes to increasing complements variety in the end. Another example is that value proposition designs should reflect service providers' intentions that certain service attributes are believed to drive customer value. But service attributes are not only the result of single providers' value propositions, particularly for content based services. Instead, service attributes are the results of the combined design of several providers' business models, and how revenue models, governance forms, value propositions and market strategies interact to produce these attributes is also important to understand.

1.2.3 Customer value issues

One of the most obvious intrinsic attributes driving the value of mobile services is the lack of constraints related to time and space (Balasubramanian, Peterson and Jarvenpaa, 2002, Watson, et al., 2002). Others suggest that "being personal" is an additional intrinsic value driver (Doyle, 2001, Kannan, Mei Chang and Whinston, 2001). Services traditionally distributed over other networks than mobile communication networks may be valued for other unique attributes. Broadcast service value is often driven by the unique attributes of community and sociability. These services are often used in family- and social contexts or are discussed in communities after an event (see e.g. the collection in Lin and Atkin, 2002). Many of the most successful Internet services, such as online banking and travel services are characterized by effectiveness, while others, such as P2P networks, are valued

for their "cost efficiency". These examples suggest instrumentality is a unique characteristic of many Internet services (Papacharissi and Rubin, 2000). Thus, the value of services traditionally accessed using a particular access network may be driven by unique intrinsic attributes not expected from or easily obtained using another access network.

Another category of attributes of network services are those originating from the network of users or complementary services rather than from supplier services and consumer investments (Mathwick, Malhotra and Rigdon, 2001; Lee and O'Connor, 2003). The two most often mentioned such attributes of network services are those affected by direct and indirect network effects. Direct network effects are the effects related to increasing value of a service as the size of the network increases (Liebowitz and Margolis, 1999). Indirect network effects originate from direct network effects when the networked good is a platform for complementary services and products (Gupta, Jain and Sawhney, 1999). As examples of such attributes, user network size is an important value driver for communication services, whereas complements network variety is an important network attribute of many information, transaction or machine-interactive services. Many network services (e.g. SMS) offer platforms for other, complementary services. Thus, the variety and quality of complementary services as well as the frequency of innovation (speed of development) in such services are other attributes driving the value of such services. To appreciate these attributes, however, end-users must perceive themselves in control of the service. Perceived control results from skills and experiences and is the result of behavioural usage patterns established over time (e.g. genres). Conducting user oriented service development is of less value for networked services because it is practically impossible for end-users to perceive the value of network size and complementarity until a network of considerable size or a

large variety of complementary services is offered. Studies in economics, marketing and information systems have concluded that the availability of complementary goods affects the prices that can be obtained for network goods (Gandal, Kende and Rob, 2000; Basu. Mazumdar and Raj, 2003; Brynjolfsson and Kemerer, 1996), whereas other studies indicate difficulties for end-users to perceive the values of extrinsic attributes (Schilling, 2003; Frels, Shirvane and Srivastave, 2003). Thus, differences across end-users' value drivers must be understood and taken into consideration in all network service innovation. Two issues are how these value drivers differ or are universal to heterogeneous network services whereas another issue is how the importance of such attributes differs across categories of end-users. The first of these issues is of particular relevance to value proposition design whereas the other is particularly important to provider market strategy definition.

1.3 Identification of service areas

The first activity undertaken in the project in which the current study was conducted was a pre-study. The aim of the pre-study was to make a well founded selection of service areas for subsequent in depth empirical service analyses. The pre-study service areas were chosen on the basis of responses from the research consortium and project industry partners through workshops and meetings. The criteria for the selection were that service areas were relevant to partners, were sufficiently commercialized in the form that they were open to empirical investigation, and also showed some variation in relevant determinants of optimal structural conditions, business models and in relevant service attributes. The pre-study covered the service areas: Corporate VoIP, Mobile VoIP, Mobile broadband, Multi play services and M2M communication services. Responsibility for the pre-study was distributed across research partners through a pre-study requirement

specification. Deliverables were integrated into a pre-study report published as SNF-Report No. 02/07 (Pedersen et al., 2007).

The pre-study identified three service areas meeting the criteria specified above. The three areas were: Mobile VoIP, Multi play/Triple play services and M2M Services. Whereas the first two service areas were considered sufficiently mature to conduct empirical service analyses of both the supply and demand side subjects, the M2M services area was considered a too large and immature to undergo traditional empirical analysis. It was decided to conduct a new pre-study to identify sub-service areas of M2M services meeting the criteria indicated above and proceed with full service analyses of the remaining two service areas. Further documentation of this decision process is found in Pedersen et al. (2007).

1.4 Report organization

The remaining report is organized in four main sections. Section 2 presents the theoretical research framework along with descriptions of the service areas that provides the context of the studies. In addition, brief reviews of recent research on the relevant service areas are given. In section 3, the method and results from the interview study of structural conditions, business models and service attributes are presented. In section 4, the method and results from the demand side studies are presented. In section 5, summaries are given of the findings and conclusions are made that span across the two service areas investigated. In addition, implications are discussed for policy makers, service providers and for further research on heterogeneous network services.

2 THEORY AND SERVICE AREAS

An SCP-based research framework has previously been applied in a series of studies of mobile services by researchers involved in the work reported here (e.g. Nysveen, Pedersen and Thorbjørnsen, 2005, Methlie and Gressgård, 2006). This framework is theoretically anchored in the field of industrial organization and the well-tested "structure-conduct-performance paradigm" (Bain 1951, Kadiyali, Sudhir and Rao, 2001). By applying this framework to the context of heterogeneous networks, models of the relationships between structural market conditions, business models (business conduct) and customer value that are theoretically well founded and supported by *empirical* research can be developed. In the following section, a brief presentation of the framework is given.

2.1 Research framework

In a SCP- framework, business model decisions are made under the considerations of current structural conditions and the creation of customer value. Thus, business model decisions are the operationalization of the "conduct" part of the SCP-framework, and as such they are similar to, and aligned with, business strategic decisions. The term business model, however, is used to focus other issues than those traditionally focused in business strategy and it also extends beyond considerations typically made during strategy processes. Only business model dimensions under the influence of managerial decision making are, however, included as relevant here. While terms like demand models and industry models are important to business modeling, they are not components of a business model when seen from a SCP-perspective. Considerations of demand fluctuations and assumptions made of demand curves or current industry regulations must be included when designing business models, but such issues are only conditions for managerial business model design.

The SCP framework may be further split into operational models to be used as research models, analytical frameworks and empirically testable models. The conceptual SCP framework applied in the studies of this report is illustrated in figure 2.1.

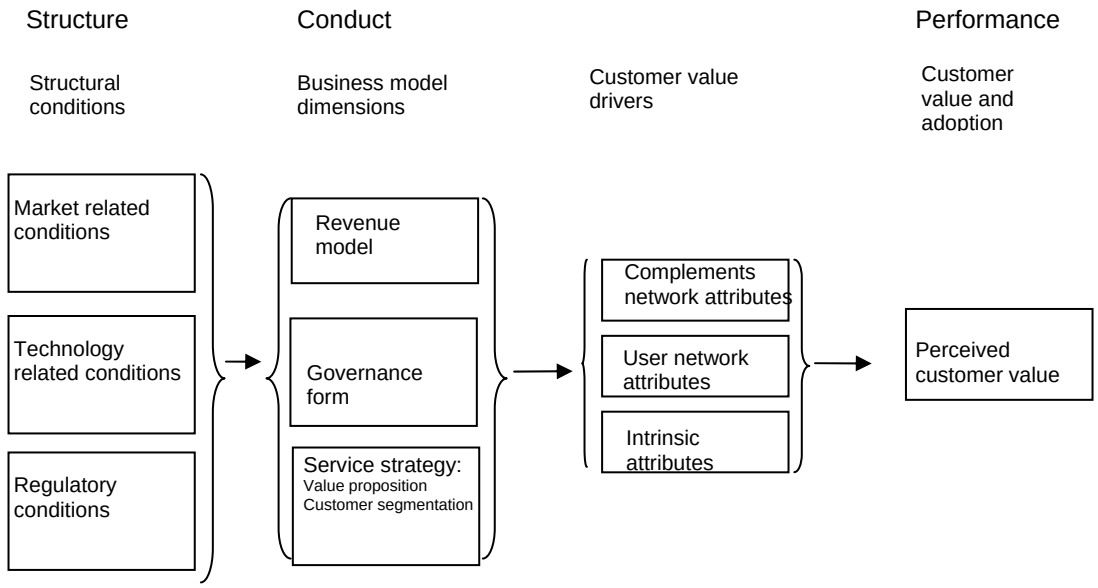


Figure 2.1 Applied SCP framework for heterogeneous network services

2.1.1 The SCP components

This SCP framework has three main components: structure – conduct - performance. Authors have discussed how structural conditions influence and limit the behavioral conduct of service providers in mobile services markets. For example, Henten et al. (2004) suggested technology, economy, market development and structure, marketing, socio-cultural, policy intervention and regulation as being among these structural factors. Others have looked at the long term dynamics of industry ecosystems in the network service market (Vesa, 2003). Furthermore, others have focused mainly on different forms of regimes facilitating

or inhibiting specific behavior by service developers and providers. For example, Godø (2000) suggested the innovation regime of a nation or sector is a structural determinant of the behavior that is likely to be exercised by service developers and providers. Hommen (2003, p. 153) suggested that in the future, regulatory structure and technological development will favor equipment suppliers and service providers to the detriment of "conventional" telecom operators. Another example is Funk (2004), who suggested that regimes in the form of "technological trajectories" of a sector or nation may facilitate or inhibit particular business models. Finally, regulatory regimes, such as licensing policy (Ure, 2003) or interworking requirements (Hagen and Nafstad, 2003; Northstream, 2002) have been suggested as important conditions for stimulating or inhibiting the development of particular business models.

In general, *structural conditions* include market related, actor related, product/service related, influence related and transaction related structural conditions. This categorization was first developed by Methlie and Pedersen (2002, and later applied to a study of mobile services by Methlie and Gressgård (2006). These structural conditions are assumed to restrict business model options. In the applied version of the framework for heterogeneous network services, we focus three structural conditions; market related, technology related and regulatory.

Business model options are illustrated in figure 2.1 by three dimensions. The choice of specific business model options made by providers may be considered a strategic choice to obtain competitive advantage. Competitive advantage can be obtained by cost leadership or by creating service attributes that differentiate a provider from other providers. The business model dimensions or options considered in the

framework applied in this report include revenue model, governance form, value proposition and market strategy dimensions.

The revenue model dimension covers the financial dimension and the governance form dimension covers the infrastructural dimension of the business model. Service strategy options cover the value proposition and customer relationship dimension of the business model in the form of market strategy including relevant segmentation. The choices of particular business model options along these dimensions represent the "conduct" component of the SCP-paradigm.

Business model choices are believed to have *performance effects*. In the SCP framework of figure 2.1, we focus customer value and adoption as the relevant performance components. To model the causal relationship between business model decisions and performance, two types of theories have been applied. The causal relationship between business model decisions and customer value is modeled combining theory of the economics of network goods and consumer behaviour theory. As discussed above, the main drivers of value are believed to be of either intrinsic or extrinsic kind. Intrinsic value drivers stem from the inherent attributes of the mobile data service itself whereas extrinsic value drivers stem from using the service, in particular from attributes of the network of users and complementary services offered. As shown above, network based value drivers, represented by user and complements network attributes are of great importance for heterogeneous network services.

In a SCP-framework, structure may affect conduct of different kinds and conduct may affect performance of different kinds. Examples of performance types are

financial results and customer value. Each SCP-model defines its particular performance dimensions.

2.1.2 The SCP relationships

Each SCP-model includes one or more causal relationships between structure and conduct, and between conduct and performance. Structure – conduct relationships may be based on theories such as diffusion of innovations theory, path dependency theory or resource dependency theory, just to mention a few relevant theories. Conduct – performance model relationships may be based on theories such as transaction cost theory, resource based theory or strategic marketing theory, or a combination of several theories. Thus, SCP models represent a conceptual framework for applying more specific operational models to particular markets.

How business model options affects service attributes

Popular uses of the business model concept involves "how you get paid" or "how you make money" (Chesbrough and Rosenbloom, 2002). The idea is that the business model concept is required because the way "business is done" is different from before, and concepts like "strategy" do not sufficiently capture these new forms of business. This change is believed to be particularly profound for networked services. Other authors have applied definitions, such as "*how the firm plans to make money long-term using the Internet*" (Afuah and Tucci, 2000), stressing that the "new economy" or "the Internet" is what requires "new forms of doing business". More academic approaches stress the difficulty in defining the business models concept without referring to a number of underlying dimensions (Chesbrough and Rosenbloom, 2002). One of the early attempts at defining the concept was Timmer's (1998) suggestion that a "*business model is defined as the organization (or architecture) of product, service and information flows, and the*

sources of revenues and benefits for suppliers and customers" (p. 31). Similarly, Weill and Vitale suggest that a business model is the "*description of the roles and relationships among a firm's consumers, customers, allies and suppliers that identifies the major flows of products, information and money, and the major benefits to participants*" (Weill & Vitale, 2001, p. 34). In a recent review of the business model literature, Osterwalder et al. (2005a, p. 17-18) suggest a business model "*is a conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a definition of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams*". As Osterwalder et al. (2005b) we find the business model concept as a tool or framework most interesting.

Recently, several authors have applied the business model concept to telecommunication services (Campanovo and Pigneur, 2003; Bouwman, 2003; Osterwalder et al., 2005b). With some variations in propositions, these authors mainly suggest four dimensions of business models; the product innovation, the customer relationship, the infrastructure and the financial dimensions, covering the product related value proposition, the customer related value proposition, the structural dimension and the revenue dimension, respectively (e.g. Campanovo and Pigneur, 2003). The business model dimensions discussed in this report correspond to the dimensions suggested in these studies. We are, however, more interested in the relationship between business model dimensions and between business model dimensions and performance. Using a three dimensional framework for business models, some examples of interdependencies may be given. For example, revenue models and governance forms are highly interdependent. To stimulate collaborative

governance forms, agreements must be made on the distribution of generated revenue. Thus, open governance forms require revenue models with easily observable revenue objects and revenue sharing agreements that let partners predict and survey the developments in revenue generation. Another example is the relationship between value proposition and market segmentation. Complex services with deep and specialized value propositions require that end-users understand and feel they control the services to generate customer value. Behavioural control of this kind may require end-user experience and some times even expertise. Thus, deep and specialized value propositions require careful segmentation of end-users. This may be particularly relevant for heterogeneous network services where obtaining compatibility across network may require experienced or expertise service users.

The examples presented above also illustrate the second type of business model relationships suggested - the relationship between specific options along business model dimensions and the performance effects of choosing specific options under different structural conditions. These relationships have been given less attention in the literature on the business model concept. Instead, performance effects of the choice of options for product-, customer-, financial- and infrastructural business model dimensions are treated separately in individual research areas such as product innovation, industrial organization and strategic marketing research. In the industrial organization field, however, one acknowledges the causal relationships between structural market conditions and business model options, and between these strategic choices and performance in the "structure-conduct-performance paradigm" (Bain, 1951). In this framework, performance is measured by a firm's business values such as profitability. Heterogeneous network services, however, are found in an emerging market of network services where performance may better be

measured by perceived and anticipated customer values and profitability may be a long term goal. Thus, integration between business model options and perceived customer values is necessary in these network services industries. It is well documented that the choice of specific business model options affects the intrinsic and extrinsic attributes of the product or service developed and produced (Nicholls-Nixon and Woo, 2003; Zahra and Nielsen, 2002; Sengupta, 1998; Stuart, 2000).

How service attributes create customer value

Heterogeneous networks are mainly innovations allowing end-users to access services through various networks, developers to design new services, and service providers to distribute and charge for new services. It stimulates a reorganization of the value chain of wireless, Internet and media services. These innovations may lead to cost efficiency or better quality, but eventually, such innovations must lead to service innovations for new customer values to be captured. As mentioned in section 1, customer value emerges from different value drivers of networked services. For heterogeneous network services, we suggest three types of service attributes that differ due to their source of value. *Intrinsic attributes* refer to the inherent attributes of the service itself, whereas *extrinsic attributes* emerge from the consequences of using the service. Finally, *network based attributes* are also extrinsic, but they emerge from the consequences of using the service in a network of users or a network of complementary services.

As mentioned in section 1, the value of mobile services may be driven by their lack of constraints related to time and space, or that they are perceived as much more personal than other categories of services. We also mentioned broadcast services, whose value is often driven by the unique attributes of community and sociability, and successful Internet services, such as online banking and travel services which

are characterized by effectiveness. Thus, the value of services traditionally accessed using a particular access network may be driven by unique intrinsic attributes not expected from or easily obtained using another access network. This represents an interesting challenge to value creation in heterogeneous network services.

In section 1, we also mentioned that many services are valued for their network attributes, consisting of user network attributes and/or complements network attributes. This is also the case for heterogeneous network services, but not all services are characterized by the same attributes driving their perceived customer value. This makes it relevant to use a generic intermediary model when studying the relationship between service attributes, resulting from business model design, and performance, here represented by perceived customer value and adoption. Among the most widely applied generic intermediary models of this type are the theory of planned behaviour (TPB) (Ajzen, 1991), the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975) and the technology acceptance model (TAM) (Davis, 1989). TPB proposes effects of beliefs, attitude, subjective norm and behavioural control on behavioural intention. The theory has often been extended with antecedents from TAM, applying beliefs such as perceived ease of use and perceived usefulness, to explain perceived value and intention to use both information technology in general (Taylor and Todd, 1995, Davis, Bagozzi and Warshaw, 1992) and mobile services in particular (Nysveen, Pedersen and Thorbjørnsen, 2005). Usually, beliefs about a service are proposed to have a direct effect on attitude towards the service and a direct and indirect (through attitude) effect on intention to use the service studied. Attitude and subjective norm are proposed to influence behavioural intention and end-user value directly. Originally,

behavioural control was proposed to influence actual usage, but the variable is often also proposed to influence behavioural intention.

Several studies have revealed influences of service attributes on end-user's value assessments. Looking at *intrinsic* service attributes, convenience was found to have an indirect effect on intention to adopt m-commerce (Khalifa and Shen, 2008), whereas perceived service availability has shown significant effects on both perceived ease of use and perceived usefulness for mobile data services (Hong and Tam, 2006). Also, personalization is found to have a positive effect on attitude towards mobile advertising (Xu, 2006-2007). Furthermore, compatibility is another intrinsic service attribute found to influence both intention to use mobile commerce (Kim, Chan and Gupta, 2007) and attitude towards wap-enabled mobile phones (Tobin and Bidoli, 2006).

An important *extrinsic* service attribute assumed to have an effect on end-users value assessment is that of cost or price. Typically, costs are revealed to have a negative effect on perceived value for mobile internet (Kim, Chan and Gupta, 2007) and on intention to use mobile commerce (Wu and Wang, 2005). A study among business customers also shows that bandwidth- and service costs are among the main antecedents of the adoption of VoIP and other converged IP services (Tobin and Bidoli, 2006).

Network-based attributes can also influence perceived value of a service through the antecedents of TPB. In a study of instant messaging services, Wang, Hsu, and Fang (2005) revealed effects of the perceived number of users on perceived ease of use, perceived usefulness and intention to use the service, whereas Lee (2006) revealed the same results for an E-learning system. Effects of complements

network attributes on perceived value are indicated in a study by Thorbjørnsen, Pedersen and Nysveen (2008), finding positive effects of complementary service variety on consumers' perceived value of mobile services.

Thus, TPB may be used as an intermediating value model that better explains the relationship between value proposition design, the service attributes that are affected by this design and the end-users' perception of value drivers that ultimately create value and initiate service adoption.

2.2 Service areas

To identify empirical contexts for the theoretical problems addressed in sections 1 and 2 above, a pre-study was conducted in 2007 investigating five potential service areas where behavioural problems and issues of relevance to heterogeneous network services were believed to emerge. The five service areas, that had been identified through industry partner workshops and meetings to ensure relevance to all research and industry partners of the Debussy-project, were; Corporate VoIP, Mobile VoIP, Mobile Broadband, Multi play / Triple play and M2M services. Of these, Mobile VoIP, Multi play / Triple play and M2M services were identified as the most interesting. For an elaboration of the arguments and methods used to identify these areas, we refer to Pedersen et al. (2007). It was also decided to apply different approaches to the further analyses of the areas. Whereas full service analyses were initiated for Mobile VoIP and Multi play / Triple play, a limited exploratory literature study was decided for the M2M service area. The purpose of this study was mainly to identify sub-services within the vast area of M2M services where heterogeneous network service problems may be studied empirically. A brief presentation of the two service areas studied empirically in this report is given

below, including a brief review of some of the recent literature of relevance to behavioural problems in the two service areas.

2.2.1 Mobile VoIP

Mobile VoIP refers to solutions for both corporate and domestic customers as well as solutions for public Mobile VoIP services over open hotspots. Several business models for such service offerings are currently commercialized ranging from the use of dual mode handsets applying SIP clients and IMS solutions to different types of "smart" services utilizing characteristics of currently offered cellular service plans (e.g. IPdrum.com). Here, we focus voice services, but non-voice services are also believed to be important to the value of the total Mobile VoIP service offering due to service complementarity (e.g. presence and voice).

For Mobile VoIP the commercial focus is currently on voice and large scale deployment of voice over IP in the mobile at users' homes and in public hotspots by dual mode handsets. The providers here pay little attention to corporate versus domestic requirements, but market this as solutions for all/any customer and for customers "roaming" between domestic and corporate "hotspots". Still, the most important and early adopting market segment is believed to be corporate customers. Being used in corporate, domestic and public contexts this is a service area where general end-user values are of relevance and the heterogeneity lies mainly on the voice side of the service. Seamless transition of voice services between cellular and wireless networks, however, requires problems of technological, business strategic and consumer behavior heterogeneity to be resolved.

In Norway, SIP-based solutions are being used by a number of small mobile operators (e.g. Hello, Lyse Tele) as well as independent service providers (e.g.

Truphone). The larger mobile operators have tested (e.g. Telenor) or commercialized (e.g. Netcom) UMA-based solutions for Mobile VoIP, but neither the SIP-based nor the UMA-based solutions have managed to reach a significant number of users. In Norway, 3G services are offered by traditional mobile operators only and the more experimental services offered by 3 (e.g. Skype over Mobile) in other countries are not available here. In general, consumers' knowledge of the functionality and availability of Mobile VoIP services is marginal, despite the generally widespread adoption of fixed VoIP solutions in Norway. Consequently, few or no statistics are available from regulatory authorities on Mobile VoIP services in Norway.

A more detailed description of the current status of this service area in Norway and Denmark, including its structural conditions, is found in Godø and Henten (2008).

2.2.2 Recent behavioural research of relevance to Mobile VoIP

Due to the newness of Mobile VoIP services, relatively few empirically oriented studies and analyses are available. Also, most studies are technical rather than behavioural. However, some studies of general VoIP also include discussions of Mobile VoIP-issues. Authors have evaluated the technological disruptiveness of general VoIP services to be considerable (e.g. Osterwalder et al., 2005a). This also goes for Mobile VoIP. Realization of the disruptiveness potential seems so far to only have been obtained for fixed VoIP. Thus, authors have questioned whether Mobile VoIP services will be offered through closed operator-centric or more open non-operator-centric models. The path is suggested to go from non- to operator centric models (Ballon, 2004).

Recent reports from NPT indicate that the growth in transition from traditional fixed telephony to fixed VoIP is now linear (NPT, 2008) whereas it was exponential in 2007. To the extent that Mobile VoIP is related to fixed VoIP, which it is at least in the domestic case, this may slow the adoption of Mobile VoIP as well. It is, however, not unlikely that the growth path of Mobile VoIP will differ considerably across international markets as the actor networks of Mobile VoIP is proposed to differ considerably in Asia, the US and Europe (Lindmark et al., 2006).

In recent literature, it is suggested that VoIP in general is covered by three value proposition elements (Intel, 2006): Reduced costs, productivity gains and increased functionality. Of these, cost reduction is most focused (Simon, 2005; Luo, Liu, Shao, and Ye, 2006), also for Mobile VoIP (Capgemini, 2005). Productivity gains and increased functionality may be hindered by lack of skills (Tobin and Bidoli, 2006), making behavioural control a barrier to VoIP adoption in general. This is also underlined by Gibson, Bilderbeek, and Vestergaard (2005), stressing the need for simplicity and low complexity of technical implementation (self assembly), and emphasizing the need for proper and fast customer support to ensure that the skill dimension will not be a barrier to Mobile VoIP adoption.

Despite potential issues of behavioural control, the general attitude towards Mobile VoIP is believed to be positive. A study by Zhang, Chan, and Fang (2004) propose effects of normative influences on the intentions to invest in corporate VoIP systems, but it is uncertain whether the same influences are likely for Mobile VoIP.

2.2.3 Multi play / Triple play

Multi play and affiliated terms such as Triple play and quad play may at one level be described as various types of marketing driven packages or bundles of ICT-

services and subscriptions offered primarily to private, residential customers, i.e. families and households. At present, Triple play is most common. Usually, these types of packages have emerged from operators of cable television (CATV) and FTTH distribution systems. A typical Triple play package will consist of these services:

- television broadcasted programs (traditional CATV service)
- high speed data communication for Internet access
- telephony, provided as VoIP

In Norway, only one provider of ADSL currently offers Triple play (NextGenTel), whereas CATV-providers (e.g. Get) and FTTH providers offer Triple play services. In quad play, mobile communication services are included as the 4th service element in the package. Compared to Triple play, the proliferation of quad play is still small.

In Norway, only one network operator, Lyse Tele, offers quad play, however, this is still (early 2008) on a trail basis, hence the service is offered only to a limited number of customers. For Lyse Tele, quad play represents a development of its present "Altibox" Triple play package, which is offered on Lyse Tele's FTTH network. The mobile communication service which will be introduced in the transition from Triple play to quad play is branded as "iMobil". In this wireless service, the mobile handset (or any other wireless terminal) will be connected to the network by WiFi-zone at home or in the neighborhood. When and if the user moves out of the WiFi-zone, there will be a seamless handover to GSM or other WiFi-hotspots. Lyse Tele has an ownership in the mobile communication operating company Network Norway, so this company will provide the GSM interworking with Lyse Tele's quad play service. Hence, Lyse Tele's quad play users also

become users of Network Norway. The "iMobil" service will require users to have WiFi capability in their terminals. The current client being used is provided by Cicero Networks, is SIP-based, and runs on newer WiFi-enabled Symbian- phones (Nokia). According to a press release from Lyse Tele, the company will test "iMobil" until the summer of 2008, after which full commercialization will be decided.

Thus, as of early 2008, quad play is still in an infant stage in Norway. Although the addition of "iMobil" in Lyse Tele's current Triple play concept "Altibox" may technically qualify this as quad play, it is still a far cry from what is envisioned in various scenarios of FMC. What constitutes the mass of Multi play in Norway is Triple play in some variety; however, because "Triple play" is not a category in official statistics, no exact figures on the dissemination of Triple play exist.

Consumers' general understanding of the functionality and availability of Triple play services is somewhat greater than for Mobile VoIP. The geographical segmentation of FTTH deployments, however, makes consumers in some geographical regions well informed of the service area, whereas consumers in other regions are literally unaware of their existence and functionality. A more detailed description of the current status of this service area in Norway and Denmark, including its structural conditions, is found in Godø and Henten (2008).

2.2.4 Recent behavioural research of relevance to Multi play / Triple play

For Multi play / Triple play services, "Quad-play", component – the mobile component is very new (Okamoto and Reynolds, 2006, p. 18), and it is very difficult to identify any empirical studies focusing either business strategic or consumer behaviour issues. For the Triple play interpretation of the service, the

situation is somewhat better. Thus, from now on, we refer to this service area mainly applying the term Triple play, and focusing the offer of bundled fixed network services telephony, TV and Internet access.

Bundling creates switching costs that may reduce competition and due to complexity, bundling also creates information asymmetry problems in consumer choice within service bundles and comparison across service bundles is more difficult. Thus, anti-competitive instruments may be applied to extensive service bundling if believed to be used by significant market power providers (see also Okamoto and Reynolds, 2006 for a good overview) to lock in customers. Thus, cost and pricing transparency are required by regulatory authorities of service bundles, such as Triple play services. Bundling may also be seen as a way to shift competition from platform competition, often preferred by regulatory authorities (e.g. Reding, 2006), to service competition.

In business model articles on Triple play, experts propose that cable and FTTH providers are currently better positioned for converged Multi play offerings than traditional telcos (e.g. Finneran, 2005). The reasons mentioned are typically technical, but there may also be behavioural reasons why this may be correct, for example traditions of more open governance forms in these industries. An overview of some European pricing models is found in Okamoto and Reynolds (2006).

A study by Sekino, Pecorari, Douglas, and Gates (2006) on consumers' perspective on multi play found that, in general, about 1/3 of consumers are interested in triple-play while about 1/3 are interested in quad play. A bit more than half (52 percent) of the respondents would be willing to buy multi play products within the next six

months. An important antecedent for adoption of multi play is savings. This seems to be understood by suppliers of multi play products. In a study by IBM (2006), the main triple play pricing strategies among multiple system operators and direct broadcast satellite providers was a 5 – 10 percent discount (45 percent of the respondents) while the corresponding pricing strategy among telecom companies was a 10 – 30 percent discount (61 percent of the respondents). For the consumer market, the segments with the highest preference for quad play are families with children, households with large telecom budgets, and cable customers (Sekino, Pecorari, Douglas, and Gates, 2006).

Some of the inherent attributes of triple play are discussed by Alcatel (2005). In particular, they call attention to 1) Service availability – the importance of 24/7 access to the three services, 2) Service velocity and user volatility – where the "*goal is instant user gratification by rapidly and cost effectively providing and adapting services in response to evolving users needs*", and 3) Service innovation and mass customization – "*allowing subscribers to create personalized bundles with flexible pricing schemes that adapt to their individual service needs, budget, and usage pattern*". "*By combining a flexible service creation and delivery environment with service subscription self-care portals, users can "add toppings" and make service profile changes on-line with minimal effort and cost for both end users and service providers*". Having all of these possibilities in mind, traditional attributes as perceived usefulness, perceived user friendliness, and enjoyment should also be included as important value drivers resulting from the intrinsic attributes of the service.

The study by Sekino, Pecorari, Douglas, and Gates (2006) also revealed that discounts are expected among most consumers if they purchase multi play, in

particular those provided in open access networks. Highest discount is expected among younger people, relatively low-spend consumers, and dial-up customers. From a provider perspective, bundling is likely not only to increase satisfaction but also to create switching costs. Customers are also likely to perceive the switching costs to be higher for a multi play offering than for an offering of unbundled services.

3 STRUCTURAL AND BUSINESS MODEL STUDY

Instead of offering a single service analysis of each of the two service areas Mobile VoIP and Triple play, this report is organized by the research framework of chapter 2. Thus, we first present the method and results from a study of the business model issues discussed in chapter 2. We then turn to the study of customer value and customer behaviour. This allows us to better compare results between the two service areas along the research framework, and enable us to better aggregate findings.

3.1 Method

Turning first to the study of structural and business model issues, we first present the research design in section 3.1. Next, results for each of the two service areas are presented in sections 3.2.1 (Triple play) and 3.2.2 (Mobile VoIP).

3.1.1 Research design

Research on business models has focused on two complementary streams; taxonomies and definitions (Malone et al., 2006). We want to extend this research by investigating models of the causal relationships that link environmental circumstances and firm behavior to market outcomes (Porter, 1991). This chain of causality helps us to answer the main research problem raised here; do strategic choices in the business models of the service providers of Mobile VoIP and Triple play have performance implications? The research model applied is based on the proposition that structural market conditions constrain the decision options under which the service providers can design their service attributes.

The nascent markets of Mobile VoIP and Triple play services make an inductive case study approach an appropriate choice of methodology for inquiring into the business models employed by the service providers. To gain a deeper understanding of business model choices of these services, we conducted in-depth studies of the chain of causality of business models of eight providers of Triple play services and four providers of Mobile VoIP services. In addition, two non-service providers were used as respondents: one market analyst on Triple play and one university professor on Mobile VoIP. The research analysts of these studies were professors experienced in e-business and telecommunications research. The business model studies of Triple play and Mobile VoIP were carried out separately and the results will be reported as two separate studies.

Our research design was similar in the two studies. We used case studies and applied a holistic multiple case design (Yin 1984), meaning that we investigated several cases, and examined each case as a whole. The comparative dimension add value in terms of external validity, and can contribute in generating new and interesting insights that often remain undiscovered in single case studies. Using case studies is a good strategy to gain insight into the applicability of our research model on these new services. Furthermore, using case studies is a good research strategy for examining *a contemporary phenomenon in its real life context, especially when the boundaries between phenomenon and context are not clearly evident* (Yin, 1981: 59).

3.1.2 Samples

Seven companies were selected from service providers of Triple play services in Norway. In addition, one interview was made with a market analyst. The sample consists of companies in various positions along the Triple play value chain or

representing different network technologies. Four of the companies were distributors or access providers: one traditional telecom operator; one broadband provider based on the ADSL technology; and two utility companies based on fiber technology. Two interviews were conducted with the telecom operator since they have separate broadcasting and telecom divisions. The two fiber companies were selected due to their differences in business models: one using an open platform and the other using a closed platform. Moving backward in the value chain we selected one company providing a backbone or trunk network for Triple play services. Finally two companies with very different profiles represented the content providers: one being essentially a large broadcasting company; the other being a content provider offering services such as IPTV, video on demand, etc. to broadband operators. As can be observed, our sample of Triple play service providers does not consist of a very homogenous set of cases. On the contrary, each case is unique due to its position in the value chain and the business model employed. This heterogeneous sample, however, enables us to explore to what extent our conceptual research model can describe business model decisions in their real life contexts.

Given the causal links between market conditions, business model choices, and performance, the optimal cases to be included in our research sample would have been the ones that score highest on the performance dimension. However, making this selection is difficult given the immaturity of the Triple play and Mobile VoIP services industry. Hence, it is too early to determine the degree of success (how well the companies perform) as the services have been in the market for a relatively short period of time.

The Mobile VoIP sample consists of five respondents; four service providers representatives and one adjunct university professor/venture capitalist with a somewhat more technological perspective than the others. The respondents in this sample are more homogeneous than in the Triple play sample.

3.1.2 Data collection

The studies of Triple play and Mobile VoIP are both based on the same research model and the same data collection methodology. Thus the two studies are described collectively in this section. Because of the strategic nature of the information needed to answer our research question, a key informant approach was chosen. Relying on key informant accounts is appropriate when the content of inquiry is such that complete or in-depth information cannot be expected from representative survey respondents (Kumar et al. 1993). We therefore selected key informants among top executives of the sample companies. The main source of data consisted of qualitative data from in-depth interviews with these organizational members, supplemented with second-hand information (mainly from the organizations' web sites).

An interview guide was used to collect information about business model dimensions, structural conditions, and service attributes. Dimensions for business model were 1) value proposition, 2) customer segmentation, 3) revenue model and costs, and 4) governance form. Dimensions of structural conditions were 1) regulation, 2) market and competition, and 3) technology. The dimensions highlighted for service attributes were 1) intrinsic attributes, 2) user network attributes, and 3) complement network attributes. The interview guide contained around fifty issues to be prompted.

The interview session started with a brief introduction by the interviewer explaining the background of the research and the main parts of the interview. The questions posed were open-ended and semi-structured allowing the respondents to freely deal with the issues prompted. Despite the defined structure of the interview guide, the flow of the conversation between the interviewer and the respondent dictated the wording and the order of the questions asked. This allowed for probing for deeper meaning and better understanding of the responses. Each interview lasted around one hour and was tape-recorded and subsequently transcribed verbatim.

3.2 Results

This section includes the analyses of the interview transcripts of the Triple play and Mobile VoIP services. Each service is reported separately. In Appendix A, a summary of findings is presented in the form of a summary table. This table is also used to discuss findings across services in chapter 4.

3.2.1 Triple play

For each of the two service areas, results are reported on business model design first, structural issues second and service attributes third.

3.2.1.1 Business model dimensions

Value proposition

Current situation

(1)[1] *Triple play is nothing more than putting together something that people are familiar with by now* is a remark of one of the respondents. Most of the

[1] The number in the parenthesis refers to the respondent

respondents, however, claim that the real value of Triple play services can only be obtained by a seamless integrated infrastructure for the three services: phone, broadband, and TV. Furthermore, this service layer must be integrated with a digital return channel which enables interactivity between the user and the service provider, for instance on-demand content. This will add significant functionality to the traditional broadcasted TV content. On-demand can be based on subscription or on "pay-per-view". First at this stage, Triple play appears as one, integrated service and not as the three separate services we are familiar with today. (2) *This is the kind of services that is exciting, not that you can bundle three services and send them through one and the same cable.*

(3) *Before we started we made some market analyses. The response from the market was that if we offered just one service the customers would buy if we were competitive; if we offered two services we got the same answer; but if we offered three services then the customer saw a value proposition here of simplicity and extended service that indeed was different from what else was delivered in the market. … This laid the path for the infrastructure we needed. In 2001 fiber was the only infrastructure that could mediate internet, voice and video together. And we got a setting where we had to bundle services that the customers perceived as valuable.*

However, it is also said that just one single provider or one single invoice is not much of a value proposition. Most users, on the other hand, probably find the installation of the three services in one access cable more inconvenient than getting the services in three different channels. (1) *There is not much convenience nor much cost efficiency in this, but there are many stickiness elements here"*. So there may be some lock-in effects that can be utilized by the service provider.

In Norway, there is only one provider of IPTV over ADSL. The current standard, MPEG-2, allows one TV per household only. The next standard, MPEG-4, is designed to deliver DVD-quality video (MPEG-2) at lower data rates. MPEG-4 may transmit two channels simultaneously to two terminals. The main advantage of the ADSL channels is the existing coverage of copper lines in Norway. 75 % of all installed broadband is ADSL-based, against 5 % fiber. Even though the growth of ADSL-based broadband has slowed down slightly, around 60 % of the total growth is on this technology. Today the distance from subscriber to exchange cannot exceed 3 km for IPTV. 70 % of all subscribers in Norway, however, live within a radius of 2 km from an exchange according to our respondent. The limitation on distance is therefore not a significant problem. (5) *However, we do look forward to VDSL2 that will push the bandwidth capacity further. So we are very relaxed with what copper lines can do in relation to peoples needs.* The ADSL Triple play provider focuses on a profile with powerful broadband (best price – performance ratio) and adventures. They deliver what they call "heart beat" with adventures and excitement; and they want to be (5) *open, fresh and bubbling*.

There is disagreement among the interviewees on the capability of copper lines to carry quality linear TV. The main advantage of the ADSL providers is that the copper lines are already there. The fiber technology, on the other hand, has sufficient capacity and can offer symmetric up- and downloading capacities but it is expensive to deploy.

Fiber providers are the only providers of Multi play today with smart home and security added to Triple play. On the fiber technology we find two different value propositions: the closed networks represented in Norway by the Lyse model, and

the open networks by the Bynett model. Lyse has developed a partnership model based on their platform Altibox. (3) *This platform is a pure IP platform where the possibilities to extract convergent services are great in the sense that when we now add the fourth play, the mobile, then you can have TV services on the mobile and you may start your dish washer remotely etc.* Altibox is distributed regionally to other utility companies who market the platform with their own brand and local content. (3) *The regional strength of these utilities has been vital for our success.* A closed model is characterized by a service portfolio selected by the platform owner. Lyse claims that this model is simpler for the subscribers and at the same time secures enough cash flow to the platform operator to allow for further developments. They claim that it is the cash flow that determines the capability to refine existing and develop new services. (3) *We have looked at some projects in Sweden, for instance Mälaren which is an open platform, and we came to the conclusion that this does not give a profitable business case simply because the customer buys the fiber but hesitate to buy services. The risk is too high.* With a closed model one prevents the customers to buy access, without consuming sufficient services for the operator to be profitable. It is important to stimulate demand for services.

The Bynett model is an open platform where all service providers can market their services on the fiber network of the platform operator. This means that the Triple play services may be provided as a bundle by one provider or as individual services by different providers. In the future some integration is necessary to ensure the functionality that the customers demand of a Triple/Multi play service, according to a representative of the Bynett platform operators. These operators claim that there is an added value for the customers on this openness. It leads to more competition among service providers which again results in greater service variety, better

service quality, lower prices, and more innovation. (4) *We hope that this open business model will favor the service providers that are innovative and clever.* More offers, more marketing campaigns, and more competitions among the service providers will trigger the customers to start using new and more sophisticated services. A question is, however, whether integration or bundling of services will close the network. (4) *It is clear that if a customer selects a product that includes all the services, then you may loose some of the freedom of choice that is characteristic of the open networks. But at the same time I think it is necessary to do this in order to get the integrations and functions that are necessary to develop the Multi play services. In the future we will probably have standards that make one product work with all the others.* Companies providing the open platforms have organized themselves in Norway in Norsk Bynettforening.

Infrastructure or platform providers are operating in two-sided markets, that is, they are providing services to two distinct groups of customers who need each other. They have to relate to content providers or advertisers on the one side and viewers/users on the other. The platform provider must offer two different value propositions, one to each group of customers. For content providers offering linear TV based on advertising revenues the value proposition to advertisers must include number of viewers, the target customer group, and the lead time to get a new campaign in the air. The goal of this advertising is to fine grain the target groups, almost down to individuals.

Future developments

With respect to the future developments, it was consensus among the respondents that seamless integration of the Triple play services over the access network with interactive services is the way to go. Furthermore, stronger user involvement in

terms of user generated content, and time and place shifting of services will develop. Platform providers will move towards offering symmetric up- and downloading capacities. Terminals will be developed that better adapt to the social setting of the users, whether this consists of one or several persons using a service together, than we see with PCs and TV sets today. Connecting Triple play services to wireless networks and mobile devices is another development trend. A problem at the moment, however, is the lack of standardization. Further developments here will enable more integrated Multi play services. Mobile VoIP will be an integrated part of Multi play with WiFi areas and local rates. Copper lines will prosper in the Multi play market with new technology such as VDSL2. (5)*When we start using VDSL2 we can reach capacities of between 50 to 100 Mbps down and 10 Mbps up on distances up to 0.5 km from the exchange. And we see that 20% of our customers have less than 0.5 km line.* Furthermore, an increased focus on quad play is expected with mobile devises through WiFi LANs and WIMAX. From a WiFi LAN a SIP client will be able to connect to the general telephone platform at local rates.

Market Strategy

Market development

All the providers follow the same pricing strategy, viz. to keep prize more or less constant while increasing capacity. One provider has increased capacity five times and increased the number of TV channels from 18 to 32 as standard. Another has upgraded their price-performance by twelve and deliver today 4.2 Mbps compared to 400 Kbps in 2001 for NOK 400 per month. It is important to maintain cash flow, but at the same time it is also important to keep the price-performance on a level that secures the "bottom line". (5) *For us to be able to deliver exciting and competitive products the customers have to pay what it costs to produce this*

product. There are providers maximizing their top lines in order to be attractive for acquisition when the customer base is large enough. It is, however, important that the customers pay a realistic price in relation to what the cost of production is to keep a stable market.

Critical mass is important in the telecommunication industry. The reason is that Triple play services need an infrastructure with high initial investments and rather small variable costs. Lyse who is partly a wholesaler and partly a retailer has its service platform in Stavanger. From here bit streams are distributed by BaneTele to its partners, the regional energy utilities. From these companies the services are transmitted to the users by the local fiber net. By this wholesaler role, Lyse is able to increase its customer base from 20 000 local customers in their home market, to close to 100 000 users of their services in Norway. This increased number of users gives the platform owner power in their negotiations with content providers and channel operators. In addition, the risk of developing and marketing new services is shared with its partners.

The incumbent telecom operator in Norway, Telenor, owns the last mile of fixed telephones and thus has a huge customer base here. However, the transition from fix to mobile phones and IP phones exposes this stock of fix telephone customers for tremendous churn annually with a corresponding loss of revenues. On the other side, the number of broadband customers is increasing but the ARPU of these customers is slightly decreasing due to the competition in the market. This forces the providers to offer more capacity over time for the same price. In 2007 the capacity was increased three times without changing prices. (2) *This is not a sustainable business model. The future business model must generate more revenue by increasing prices on content and/or by providing value added services to the*

customers, says a representative of Telenor. Furthermore, Telenor is vulnerable for cannibalization internally. They deliver content through several channels: the ground television network, cable and satellite. In the future IPTV will add to these distribution channels. Due to the large market share of Telenor they have to apply a broad market strategy.

Operators of closed network platforms are normally focusing on the top line in order to secure sufficiently demand to cover their large initial costs. Open platform operators, on the other hand, look at themselves as intermediaries just connecting service providers with customers. Energy companies make use of their existing customer base (power customers). Content providers look for market strategies that address both sides of the two-sided market.

Market segmentation and market channels

The content providers find it difficult to divide the market in terms of viewers or users. (7) *To divide the market into aged based target groups, for instance, is a tough job in a small market. The advertisers want to target 20 years old people only, but the problem is that there are only 60 000 of them. However, we need to have viewers at the age that the advertisers ask for. So we compose our transmission schedule according to target groups.* So the market is divided into segments according to the number of viewers for various contents. This segmentation is done on the basis of age, gender, interests, etc.

Also, the providers indicate different strategies for the various components of the Triple play service. They see new segments such as older people and lower income households now demanding broadband. With respect to fiber deployment they will go for the high income segment first. For the TV/video services, bundling of TV

programs are used for segmentation reasons. Also, segmentation criteria known from consumer behavior theories can be used. (1) *When we have been working with these things we have looked at various segments; something we called simple surface (older people); couch potato (sedentary life with much TV viewing); laid back (easy going, the entertainment segment); and leaned forward (active and persistent). There are many ways to do this.*

Other providers use direct channels such as web and phone to reach new customers rather than retailers. Another way to address the end user market is through large companies where they can reach a great number of potential customers. By entering into agreements with these companies employees are offered discounts. Similar agreements are employed to reach students at universities and colleges. Partnership through a branded platform is still another way to enlarge the market.

Several providers mention the change in market focus for broadband from the family-with-children segment to the older-age segment that shows an increasing demand. (2) …*within broadband now it is roughly the aged segment and low income households that sign up or should be targeted.* Furthermore, the market is considered to be inhomogeneous with respect to age segments. Another important segment is the housing cooperatives and co-ownerships. These organizations were the first to pick up the Triple play service. The market channel of housing cooperatives is very different to that of end users. In a housing cooperative the decision to buy is made once a year on the annual meeting. A household cooperative is composed of tenants or individual owners of very different needs.

To sum up, it seems that the providers are considering different segments, but it is difficult to observe significant effects of this in their marketing efforts, maybe except for the TV content.

Branding

Some of the providers have clear brands that are utilized to broadening their scopes towards multi access channel media houses. For other providers, branding is not to the same extent apparent. Open network providers often co-brand often with their service providers.

Governance Form

Vertical integration

The digital content market in Norway, as in most countries, undergoes tremendous changes, and the actors in the market are forced to reposition themselves in the value creation processes. Triple play forces telecom network operators, broadcasters, content providers, and internet players into one, common market, where new bundles of services are provided. This new market creates structural changes and new forms of rivalry among the players. Content providers and distributors cooperate more closely. Distributors have gone backwards in the value chain and co-financed distribution rights with content providers, for instance in providing sport events that have been incredibly expensive recently due to its popularity. The cost of the rights to distribute these events has skyrocketed beyond the capability of advertising financing. Direct payment from end users is necessary. Experiences show that the audience is willing to pay for streamed content by soccer game for instance. (1) *We did see some quite interesting things regarding our soccer product. The first year we sold all the games for NOK 795,-. The year after it was sold on a monthly subscription basis for NOK 149 per month, corresponding*

to 1788 per year, and tripled the number of subscribers. We more than doubled the price and tripled the number of subscribers. So this is no "homo økonomikus"; here are other effects that are decisive.

For the cooperation to work out, some kind of revenue sharing between content provider and distributor must be developed. In the new digital service markets we find a number of new cooperative constellations among different players of the value chain, and we find each player partnering in a number of different ways. Although we have seen much cooperation the competition has also increased. Another vertical integration strategy is built on taking ownership positions along the value chain (the infrastructure) using these for marketing and technology intelligence.

Still another strategy is to build on contractual agreements among the players to regulate everything from revenue sharing to end-user quality. Furthermore, these agreements include who is responsible for what in the value creation process. The development of these contracts has been a kind of chicken-and-egg process. In the beginning it was difficult for the platform owners to attract the content providers and achieve good agreements due to small customer bases. With an increase in the customer base this situation has improved. (4) *We try to promote other cooperative partners to enlarge our value network,* says one of the respondents. Things are changing rapidly in this market and a partner network is believed to be better than one-to-one relations for continuous updating. In these networks partners do both compete and cooperate. (5) *We have very tight value creating relationships with our suppliers to develop the most efficient and effective solutions"*, says another respondent, and adds *"It is clear that when the prices in the end user markets go down, the suppliers must run faster. The evidences of this can be observed by the*

large mergers such as Alcatel, Lucent, and Ericsson. The supplier relations can either be market based or long term relationships including such as mutual competence transfer, technology transfer, risk sharing, and financing.

IP-based platforms can offer interactive services with new revenue streams attracting more content providers to the platforms. Many providers want to be present on multiple access channels. At the same time the competition among the channel aggregators is increasing and there is a battle for buying exclusive rights. This creates new relationships in the value chain with an increasing fear among some providers that content providers will bypass the distributors. (5) *Taking payment for content requires quality in delivery to the customers"*, says one distributor. *"To enable this we have to divide Internet into three parts. On the top we have the non-guaranteed quality, so called "best effort" service, for example YouTube content that is delivered free on the Internet. The level below, what we call Level 2, is where you enter into a partnership with the content provider. This means that when the content provider sells its content, for instance soccer games, to our customers we guarantee for quality delivery of this dedicated service in our network against a share of the revenues. The lowest level of the Internet is where we deliver triple and quadruple play services. This is where we guarantee for all services. This means that delivering video or third party content and receiving payments from customers require a quality guarantee. We do not think that customers are willing to buy a soccer game and then being disturbed by interruptions. We think that if this is going to work, you must guarantee quality. This means that the business model of the content provider requires tight relationships with the distributors*, says the distributor. Some people are concerned with the quality, others with capacity, and still others with stability. With the development of Internet today we will soon experience capacity problems and then

cooperation on Level 2 will be important to secure customers' quality and sustain their willingness to pay.

Horizontal integration

Some providers have horizontal partnerships to reach larger markets for their services. The goal of horizontal cooperation is to increase customer volume and thus gain negotiation power towards the content providers. When Lyse started with its Altibox platform back in 2002 it attracted a lot of interest both nationally and internationally. They saw then the opportunity to serve other owners of fiber infrastructure from the same platform. Today Lyse has 32 partners served from the Altibox.

Horizontal partnerships require management through several bodies. For example, a product market board to look at future trends and give advices to the product development department. There may be kick-off meetings and end user meetings among the partners and their customers. All organized as cooperative commitments of the partnership. Other horizontal partnerships have been organized to set up trunk networks (Bredbåndsalliansen). Open platform providers organize themselves in more loosely connected partnerships while closed network providers are organized in more tightly connected partnerships.

Revenue Model

Revenue streams

TV is a very good branding medium. For a commercial television broadcaster, the revenues from advertising constitute a substantial part of its total revenues. (7) *Revenues from TV advertisement are to day equal to revenues from daily newspaper advertisements in Norway*. Thus advertising is important to commercial

television broadcasters, but other revenue sources must be sought in addition. These sources consist of subscription payments, sponsorships, end user payments for interactive services, web advertising, and finally content delivery on the mobile. Even though the advertising segment is growing rapidly, pay TV grows even faster. (7) *Looking at the market in Norway totally, the TV advertisements constitute for 3 billions NOKs, licensees close to 4 billions, and pay TV 4 billions. That makes a total of 10-11 billions, and this is primarily for broadcasted TV. In addition, we have IPTV with on demand that gives a "long tail economy" with respect to copy rights. The big cost drivers of a universal broadcaster are the production of live programs, and acquisition of copy rights*. The cost of sport rights has increased tremendously. Here, we have seen that the competition between platform operators has lead to purchase of exclusive rights of such events as Champion League and Premier League soccer games.

There is a false distinction today between TV-centric and PC-centric interfaces. On TV we do expect to pay for content; on the PC connected to Internet we expect everything to be free. To be free, however, means that the end user does not have to pay anything. Normally it is advertising that pays for the content. The expectation of free Internet content will change with the transition from "best effort" to "quality of service" (QoS). The quality restrictions on TV transmission have always been high, much higher than phone transmission. This indicates that the copper lines used for phones are not directly suited for TV transmission. The respondents see a change in usage patterns, especially among the young ones. This change requires a change in the way the providers communicate with their customers. (2) *We are in the middle of a change process. We are loosing revenues due to changes in demand patterns and must get rid of huge cost items. We have to be able to produce the new services at lower margins – much more cost efficient*, says one of the providers.

We see that more and more customers choose higher capacity on their broadband. ARPU, however, is kept almost stable or only slightly increasing. In this commodity market with high competition and pressure on prices, and falling demand on the basic services, new services have to be introduced so that the customers will consume more, says a provider. It is necessary to have an infrastructure that scales well with changes in demand. The situation at the moment is very dynamic and we will see changes in the business models of the content providers. We will see more user generated content, peer-to-peer services, and time and place shift of TV broadcasted content.

A channel aggregator will have to operate differently depending on whether it sells its services to a closed network provider or an open network provider. The revenue model for closed networks includes normally revenues per customer and month and this is paid by the platform operator. For open platforms, revenues flow the opposite way. Here, the end customers pay the content provider for the content, who will return some of this revenue to the platform operators. These two revenue models require totally different invoicing processes and customer service center operations.

The largest cost driver for channel aggregator is buying TV rights. The costs of these rights vary depending on the access platform and technology. The fear of illegal reutilization and diffusion of content is today less than it was 6 -8 years ago. The trend by the large content providers is to make more and more of the content available.

When it comes to the open platforms, the normal price model is to charge the service providers for each service the customer subscribes for. It is the customer that selects capacity among the offers of the service providers. The higher capacity, the more it costs! (4) *When we started, the service providers took their ADSL products and moved them to our infrastructure. We got asymmetric products based on 300 Kbps to 1 Mbps. We see now that the providers are leaving asymmetric products and only deliver symmetric products. The capacity increases and now we have many customers on 15 – 20 Mbps.* The customers receive their invoice from the service providers (which mean that they get one invoice for each service) who pay the platform owners their share depending on the number of customers and capacity usage.

The closed platform owners deliver Triple play as a bundled service or as each component of the bundle separately. The pricing model consists normally of a start up fee followed by a monthly fee. The revenue model of the partnership follows roughly a franchising model where each partner pays for access to the platform and a cut of their running revenues.

3.2.1.2 Structural Conditions

Regulation

Regulatory authorities

Incumbent telecommunication operators are often defined as a "significant market power" (SMP) which means that they have to comply to certain rules given by the PTT. As such (1) *We can do a bundle of the three products in Triple play, but since we are an SMP the bundle is regulated, and then we are committed to price transparent regulated prices because the customers have the right to debundle the offer if they want.* (2) *We are not allowed to give discounts across markets in which*

we are dominating. The telecommunication sector is much more regulated than the broadcasting sector, and the prices taken for the services have to be defended from a debundling point of view. The problem for an SMP then is to get paid for signal transmission of broadcasted services on the phone network. (1) *With the pricing mechanisms we have today – this is a challenge. If we should charge normal access prices for TV transmission in the Triple play service today, people will resist. So putting broadcast on top of UMTS and xDSL is prohibitively expensive.*

(2) *There is no LLUB on fiber, but it may come. IT may come that we are forced to have an open net approach.* Without any regulation that takes into consideration the large investments a new infrastructure entails, it may stop the willingness to invest here. (2) *The one who seeds should harvest.* The fiber providers think that LLUB will come to fiber. (3) *At some point in the future at a certain level of concentration and volume on fiber we might see regulation here".* But then, all access technologies should be subject to the same regulation, they say. Today the situation for fiber, cable, and copper are not the same. On fiber and cable the network owner delivers the content while the copper lines are open for virtual operators. From a regulatory point of view one is not allowed to merge cable TV with xDSL today.

Regarding the regulation of open versus closed networks the interviewees have different opinions depending on their point of view. Open platform owners claim that the authorities are more in favor of open platforms. (4) *We have got indications on that from the politicians. We see this also in the allocation of "Høykom" funds where they require that the networks they finance should be open networks.* Others do not believe in any intervention of the regulating agencies on open versus closed networks. As long as PT prefers infrastructure competition rather than service

competition, four to five infrastructure alternatives should be enough to keep the competition up.

With respect to content we see a tendency that channel packages become more and more alike. From a consumer point of view more freedom of choice is desired. This can be achieved by smaller packages or a kind of á la carte packaging of TV channels. This is supported by the authorities in several sectors. This position, however, is not taken by any operator in Norway yet. According to one respondent we will see more freedom of choice in the TV channel market ahead. However, against this works the economics. Large initial costs require a high top line focus and with more freedom of choice, especially consuming smaller packages of TV channels, may erode the ARPU. Altogether, there seems to be a tendency towards choosing smaller packages (more open content) and greater flexibility of choice.

Today several agencies are involved in the regulation of the Triple play market. In the future, however, the respondents believe that more of the regulation will be transferred to the competition authorities as we see more competition in the market. The energy companies are also regulated by NVE. (4) *Now we are not allowed any longer to put fiber infrastructure on the 22 kilovolts lines. This is a change in our general conditions that impose difficulties; the infrastructure becomes more expensive to build.* The use of existing power lines to deploy fiber has given the energy companies important scope economics.

Market and competition

The market and competition issues are concerned with horizontal market competition at each stage of the value chain as well as the cooperative competition (cooptition) among the players along the value chain (vertical competition). It is

said that the content owner strives for the control of the customer interface. Today it is the distributor who owns the customer. While content flows from producer to consumer, revenues flow from consumers through distributor to content producer. One of the main issues today is whether content owners will bypass distributors to get better control of the customer interface. If the customer has more freedom to choose content á la carte, power will move from distributor backwards to content owner. The distributors represented here, however, are not afraid of this because the content owners are dependent on them to deliver content with a guaranteed QoS. The distributors see the partnership between content owner and distributor as the winning team. (7) *The distributor wants to maintain the control through a gatekeeper role. One wants to establish a portal through which the access must go. And you see that the operators go to content to increase the ARPU. So in this scenario I think we will have a discussion on the distribution of the value creation. The content providers have until recently considered distribution as a cost instead of revenue. And then someone has taken the super profit of the distribution to the households.*

On certain interactive IPTV services, however, the content owners will have a more direct relationship with the customer. On the other hand, the content owner will always search for as broad distribution as possible. TV2 is available on almost all distribution platforms. An interesting battle has been going on between TV2 and the two satellite companies, CanalDigital and ViaSat, on distribution rights. An agreement has been reached that TV2 will now be available for the about 1 million satellite receivers in Norway. Previously TV2 negotiated an exclusive agreement with CanalDigital. The consequences for the competition of this new agreement are interesting. TV2 is now available on all distribution platforms in Norway. Will we see movements of the customers between these platforms?

It is claimed that the energy companies are loosing money on their telecom-services, and that this market is subsidized by the electricity subscribers. (2) *We do see that energy companies have better and better alliances and many municipalities prefer to go to its own energy company to get broadband. We are surprised by this subsidization in the order of billions NOKs between energy and broadband and that nobody looks into this.*

Technology

Digital TV is carried over fiber and copper based IP networks. Fiber has today a comparative advantage with respect to capacity and thus quality TV. Fiber, however, is expensive to deploy while the copper lines do exist in most premises. The limitations of copper and xDSL will be eased when the new protocol MPEG-4 is available. This standard will increase the capacity about three times compared to the MPEG-2 standard today. A tremendous increase in capacity can further be achieved by the use of the VDSL2 technology. VDSL2 is currently the most advanced version of all DSL connections. VDSL2 offers a symmetrical upstream/downstream rate of 100 Mbps. VDSL2 offers the very fastest speed, with a strong distance range, for Triple play services on copper lines. Despite this, it is believed that the TV industry will rely on DVB for linear TV for a long time yet. (1) *To deliver linear TV on IP networks is terribly expensive. For linear TV, broadcasting is the most cost effective distribution form,* says a representative for TV broadcasting.

The electronics to manage the services carried by these networks will have to improve. One foresee a new generation of terminal equipment, for example new set

top boxes, to appear; more Windows Media Center "look alike" boxes that can be managed by the user in other social settings than the single PC user environment.

3.2.1.3 Service Attributes

Intrinsic attributes

Price is the most important determinant of demand, more than convenience through bundling and simple invoicing. If you ask the customers, they want to have *freedom of choice*. However, when you look at their behavior they rather choose bundles than picking services freely. It is like a restaurant where you have fixed menus and á la carte. Most people choose a composed menu. It is, however, important to offer freedom of choice although it varies across customer segments, especially with age. The older segment appreciates simplicity before freedom of choice. The younger customers are more concerned with price and quality. *Quality* ensures satisfied customers. *Brand name* is also important. Well known brands, especially the established brands, are chosen relatively more by the older customer segment. It remains to be seen the effect of brand when it comes to one-to-one relationship TV. *User friendliness* is a third attribute often mentioned by the interviewees. It is especially important to develop user friendly interfaces of the set top boxes. Also, many customers ask for HDTV

User network attributes

All the respondents are positive to building user networks and several of the actors on the Triple play service arena in Norway have already developed community sites under their own brand name. TV2 Sonen, Broadpark.no and Multigamer.no are examples of web sites to enrich the Triple play service and create communities of users. This development is in its infancy and several are skeptical about running such web sites due to privacy protection aspects. They feel that they have

obligations as an operator to protect the customers on these issues and do not trust that people will guard their personal information enough on their own.

Complementary network attributes

The size of the user network, i.e. number of viewers, is important when negotiating content from the content providers. These providers want to sell bundles of channels where the bundle contains prime channels as well as less popular channels. The content providers will not allow you to cherry pick only the best. However, the quality of these bundles depends on the quality of the individual channels and the thematic composition of these. TV2 has developed the complementary attributes with its Sumo concept. Sumo as a TV portal and an IP-based distribution platform add functionality to the broadcasted TV2 programs. Others are still reluctant to these developments.

3.2.2 Mobile Voice over IP

Below we present a discussion of the variables and the relationship between them for the service area Mobile VoIP. The discussion is based on the five interviews. Quotations from the interviews are used to illustrate and concretize the general discussion. Quotations are written in italic. As for the Triple play results presentation, we start the discussion with dimensions of business model. Then structural conditions are discussed along with how they influence business model dimensions. Finally, elements of service attributes, and how it may influence structural- and business model dimensions, are deliberated.

3.2.2.1 Business model dimensions

Four main dimensions of business models are included in our model. The respondents' viewpoints are presented one by one for each of the four dimensions.

Value proposition

The respondents rather unanimous point to lower prices as the main value proposition of Mobile VoIP. (3) *The only obvious value proposition we have found is reduced price,* and (4) *The value of Mobile VoIP is reduced costs* are representative statements by the respondents. Reduced price is relevant for all calls, but the potential for reduced costs is particularly relevant for international calls. Thus, (3) *The value is higher for international calls via wlan*. A second value proposition is that Mobile VoIP makes call costs predictable. Users do not experience surprisingly expensive calls when using Mobile VoIP. This is because the price model typically used for broadband services is a flat fee, and such a price model (5) *gives you more predictable costs*. A third value proposition pinpointed by the respondents is the possibility to offer consumers higher voice quality than we are used to today. Although some of the respondents see a potential for differentiation on voice quality for Mobile VoIP – (4) *you may claim that the quality of the sound is a bit better* - , it is not considered an important value proposition – (5) *I don't believe willingness to pay for high quality sound is high*. The last value proposition mentioned is the possibility to use one number only – (3) *you have one terminal and one number* - meaning you do not need to remember two or more phone numbers for each and everyone you need to call.

Market strategy

Most of the respondents consider the business market as the most relevant market segment today for Mobile VoIP. In particular, industries operating in an international market – like shipping, finance, oil and gas, etc – are particularly relevant segments because the potential price reduction will be highest in industries where international calls constitute a large portion of total calls. (1) *You have to*

approach specific segments. Shipping is a typical one……a lot of traffic…….access from their domestic offices, international offices, from the airport, etc……pluss the financial market……..and the oil sector. An interesting paradox is mentioned here by one of the respondents. A precondition for using Mobile VoIP today is the possession of a rather new and expensive mobile device. People possessing such devices are typically sponsored by their company both when it comes to the device and the subscription. Although they have the possibility to use Mobile VoIP, they do not have an incentive to use it because their company is paying their phone bills. This paradox may be a hindrance for a fast diffusion of Mobile VoIP even in the business market. A reason for the lower relevance of the consumer market is the somewhat special pricing in the Norwegian market today with subscriptions as for example "Fri venner", "Fri familie", and "Trådløs familie", making it relatively cheap to make calls to frequently called parties. (2) *Looking at the privat market, there are many operators offering voice services for free user to user*. Thus, incentives for buying a new and expensive device to reduce call costs are nearly non-existing. It is also mentioned by one of the respondents that users need some level of technological interest (and skills) to be able to use Mobile VoIP today. Although the respondents do not predict a fast diffusion of Mobile VoIP in any segments, they do believe that Mobile VoIP will be a common voice service in some years from no. (4) *I believe this technology will be available in all segments.*

Some of the respondents brought up the importance of consumer support for Mobile VoIP. (3) *One of the most important issues is to get good products and that consumer service is perceived as high*. Because the value chain is split up and because of the wide variety of networks used, it will often be difficult to reveal the responsibility for a failure – like lack of access to the service. It may be possible for large companies to negotiate some kind of support agreement with an operator, but

for single consumers, this is not possible today. Because consumers are used to a market situation where the operator is responsible for voice services, operators may be reluctant to launch Mobile VoIP services – because failures may be attributed to them - although other actors in the value chain may be responsible for the failure. Consequently, a higher level of service quality has to be established for Mobile VoIP, in particular for the consumer segment, before Mobile VoIP will be launched by some of the operators in the market.

Governance form

It is revealed through the interviews that the business of Mobile VoIP has a somewhat more disintegrated value chain than traditional mobile telephony. However, companies do cooperate. In particular, operators seem to cooperate with client developers. (1) *I have to have a close integration with client suppliers. There are so many phones……and you don't have chance to serve all of them on one client, you need a specialized company to do that.* The cooperation focuses on the development of clients, and the cooperation is described as rather close. Other actors are often also included in the cooperation of the development of clients.

With the exception mentioned above, the main impression from the interviews is that cooperation between the involved actors in the value chain of Mobile VoIP business does not cooperate much. (1) *What we believed would be more network oriented models has not been realized in this area…… It has not become as open as we expected*. Most development and work seem to be conducted in-house, and we do not see many examples of open network models. The need for cooperation with external partners does also seem to depend on the size and the breadth of the company. For companies with departments specializing in WiFi, broadband and Mobile VoIP, these departments do of course speak together and coordinate

internally. For smaller actors with less breadth in their activities, the need for cooperation with external actors is more prevalent. Device actors like Nokia seem to have a lot of influence in the market, and other actors in the market have to be large to influence these device actors. Overall, it seems like the larger actors in the market do not cooperate with many actors but that they have some cooperation with the most influential device actors. Through such cooperation they may be able to influence the direction of the development in the marketplace. It seems like the smaller actors have to base their activities on a larger degree of cooperation with more actors. However, the smaller actors seem to struggle to influence the main features of the development at the market place.

Revenue model and costs

One revenue strategy is the acquisition of companies as customers. Although it may be difficult to make money on their IP based voice subscription alone, the revenue stream can be generated by offering value added service on top of the Mobile VoIP service – such as conference systems, voice messages, etc. (1) *Mobile VoIP……is an argument to get access to the business market, but the revenue will be generated on other phone related services*. This corresponds to other respondents arguing that Mobile VoIP is not a business model on its own, but part of a larger business model. One of our respondents pointed out clearly that (2) *Mobile VoIP is not the business model*. Furthermore, one of the respondents claimed that in short time telecom operators will be called communication providers or something like that. (2) *And that includes video, it includes presence, it includes voice messages, etc. And all the ways we communicate today will be based on one platform, and that is IP…… So looking at our business model and our offerings, it is the total package we are hunting for*. It is also indication in the empirical material that revenue from both business customers and individual consumers will be based on flat fee

subscriptions rather than the unit price consumers are familiar with from traditional telephony. Revenue from termination is not common for Mobile VoIP providers in Norway, but Network Norway is providing service providers a part of their revenue for termination. Thus, termination revenue can be a potential source of revenue for Mobile VoIP providers. Finally, an alternative strategy for making money is to build a customer base of Mobile VoIP and go for an exit solution – meaning that other companies buy you out.

Sales acquisition costs are highlighted as an important variable cost component. (1) *Most costs and revenues are predictable, except the sales acquisition costs*. By approaching companies and making deals with them, employees in the company can relatively easily be reached as individual consumers. Thus, sale of subscriptions to individual consumers through the company reduces sales acquisition costs and increases the chance of profit. (1) *It is one thing that means something in the mobile market in general, and that is sales acquisition costs. It is very important to get the sales acquisition costs as low as possible…..* For actors in the industry that do not own their own net (infrastructure), network charges are a high cost. By moving to IP-net, costs will be significantly reduced. On the contrary, such a change will reduce the revenue for actors owning a net/infrastructure (incumbents). Consequently, we see a potential conflict of interest where MVNO's have an incentive to move to Mobile VoIP while traditional operators owning their own net/infrastructure (incumbents) have an incentive of keeping business as usual. More generally, incumbents have costs related to their net/infrastructure while revenue is collected from subscriptions, units, and termination fees. MVNOs' have costs on core net in addition to start-up costs and network charges on physical nets. Revenue can be considered to be discounts on start-up and network charges (which is a cost reduction rather than a revenue) and revenue from termination and on

conversation between their own customers. Virtual service providers have costs related to billing system and a media gateway to communicate with PSTN. They also typically pay higher start-up costs and network charges than MVNOs. Virtual service providers typically do not have termination revenue (service providers of Network Norway is an exception). Revenue is based on flat rate subscription. Flat-fee as a pricing model makes Mobile VoIP attractive for access providers – increasing the attractiveness of broadband access.

This costs- and revenue structure makes it possible for MVNOs to have lower costs and lower turnover. Consequently, they can accept a lower average revenue per user (ARPU), but nevertheless earn more money per customer – because of the reduced costs. (4) *And that really attacks their competitors – the incumbents – because they can operate with a lower total turnover but, nevertheless, receive a higher return per user because they have lower production costs.* The key to increase ARPU among MVNOs will probably be to focus service innovation and offer consumers new and value added services.

3.2.2.2 Structural conditions

Structural conditions include external factors assumed to influence choices in companies' business model. Three main factors are discussed.

Regulation

Regulating actors mentioned as relevant among the respondents are in particular Norwegian Post- and Telecommunication Authority (NPT), but the Data Inspectorate and some Ministries are also mentioned as actors that influence the opportunities of the companies' business models. One opinion is that the Norwegian Post- and Telecommunication Authority protects the large players in

the industry and that this reduces the possibilities for smaller and newer actors to take a significant position in the Mobile VoIP market. (1) *It is about 30 actors in the market…… when one of them goes bankrupt we learn it does not have more than 1400 customers. NPT says this is competition. I say it is bullshit. ……..The two large ones have too much power*. Others claim that the differentiation of termination fees regulated by the Norwegian Post- and Telecommunication Authority is sensible. However, the termination fee is also considered to be a huge brake for the industry today, because it makes it difficult – in particular for small actors - to introduce new services to be used across networks without having to pay large amounts of money in termination fees. One of the respondents suggested that Mobile VoIP operators also should be allowed to collect termination fee and that regulating authorities should stimulate the growth of Mobile Virtual Network Operators (MVNOs). (4) *It is very important that NPT allows Mobile VoIP operators to collect termination revenue. If they say it is not allowed it will be difficult to earn money for a Mobile VoIP operator*.

It seems to be a general opinion that regulating authorities are a bit static. The obvious advantage is that this creates stable framework conditions for the actors in the business. (1) *You know what NPT will do the next 18 months* and (2) *There will be no "bombs" from the regulatory authorities*. The downside is that some of the actors feel that this static position reduces the chance of change and innovation in the business. Only one of the respondents has a feeling that the authorities slacken some of their requirements and conditions a bit when it comes to Mobile VoIP – and he interprets this as an attempt to stimulate innovation and growth in Mobile VoIP.

One possible limitation and hindrance imposed by the authorities, which typically strikes the smaller and challenging companies seems to be the demand for security and tracking of calls and requirements related to emergency calls (location of call origination). However, one of the respondents claims that security and privacy protection is not a bigger problem for Mobile VoIP than for ordinary mobile voice services. One possible solution is that emergency calls automatically are done from the mobile part of the device. What is also mentioned as a possible hindrance is the complexity of operating in a global market under different regulating conditions in different countries.

Market and competition

It seems to be a rather general opinion among the respondents that the market is dominated by a few large actors with a high degree of influence. (1) *Three actors are well known; Telenor, Netcome and Tele2. The rest is "others"*. In the present market we can se how they have muscles to stand up against challenging developments and actors, for example through subscriptions as FriVenner and FriHet, reducing the relative advantage of Mobile VoIP. However, also device producers, software designers and network infrastructure manufacturers have dominating roles. Microsoft can subsidise devises to strengthen the diffusion of Windows and/or refuse sale of their devices with clients they do not prefer. Nokia can take control of software like they for example do by Symbian Signature. Providers of network infrastructure like Ericsson, Siemens and Alcatel/Nortel also influence the development through their choices and speed in the development of network infrastructure.

Overall, the story seems to be that the large and well established actors try to protect the status quo and their existing business models. However, the competition

will increase, and over time, the established actors may have to compete under new and different conditions than today.

One of the respondents meant that it would be possible to earn money on Mobile VoIP within about one year. (2) *We are talking about 2008/2009*. One of the other respondents estimated that mobile voice would be IP based within six to seven years.

Technology

One central question is whether Mobile VoIP will be based on unlicensed mobile access (UMA) or session initial protocol (SIP). The unambiguous response from our respondents is that open standards as SIP will be the solution for the future and that (2) *UMA will fail*. As one of our respondents claims; (2) *All future communication will be IP-based*. As a result of the heavy investments in infrastructure conducted by the incumbents, we may see attempts to launch UMA based solutions for Mobile VoIP, but over time, SIP will be the standard for Mobile VoIP. (4) *….incumbents with huge investments in infrastructure and infrastructure manufacturers, like Ericson and others, they have a lot to loose when this moves to the Internet model*. A somewhat more complementary perspective, claimed by one of the respondents, is that we will have four technological directions that will have a parallel development. They are 1)3GPP, GSM and 4G mobile telephony, 2)SIP, 3)Enterprise voice, and 4)Proprietary services like MSN and Skype. These technologies have their unique strengths and will exist together. Integration between the technologies will be an important challenge.

One major technological impediment seems to be the lack of technological standardization. Clients are not standardized, and clients have to handle various

types of hotspots. There are also several challenges related to SIP and wireless routers. Technological compatibility, or interoperability, is a bigger problem for IP devices than it is for traditional GSM devices. (2) *There is no doubt that IP devices have a larger incompatibility problem than GSM*. Other technology related factors that limits the development of Mobile VoIP is the lack of user friendly devices and solutions and the battery capacity of most devices when WLAN scanning is on. Finally, only a few devices in the market today are adapted to WLAN, which of course limits the diffusion of Mobile VoIP, but this impediment will probably be significantly reduces within a year or two.

Because of the splitting of the value chain and the heterogeneity of the technology, it will often be a problem to track the source of errors and service failures. The source of a failure may be the device, the client, the service provider, the WLAN, etc. Some of the potential providers of Mobile VoIP may therefore be reluctant to launch Mobile VoIP services because failures that cannot easily be tracked can be attributed to the service provider and damage their brand name. Until this problem is somewhat better solved, we may see that some of the established actors await the launch of Mobile VoIP as a strategy to protect their brand name. (3) *When you are big you need a very good and streamlined customer support.*

A relatively small share of the devices available today can be used for Mobile VoIP because of technological limitations (e.g only a few of them have WiFi capability, operating systems are closed). The price for the suitable devices is also rather high today. However, more and more devices will be launched with the necessary technology, and the prices will typically also be reduced for these devices in a year or two. The features necessary for Mobile VoIP will (4)…..*flow from the expensive and fine N95 phones over to the cheaper ones*.

3.2.2.3 Service attributes

The chapter on service attributes is a discussion of possible effects and/or outcomes for Mobile VoIP from the consumers' point of view. All assessments, however, are made by the service providers, so these attributes are the attributes believed by providers to be important to end-users.

Intrinsic attributes

The main intrinsic attribute, and the main advantage, of Mobile VoIP seem to be the possibility to make calls for a lower price and with a fixed price plan. (2) …*it will be price, price, price in 70 percent of the cases*. In the other 30 percent of the cases, value added services like mobility, one number, etc. are suggested as constituting the main intrinsic attributes/values. Mobile VoIP gives consumers one more opportunity to choose from when making a call. Because of the complex pricing of call services, some of the respondents point out that when consumers make a call, it should automatically be set up in the cheapest way. It is also possible to offer higher quality voice services through Mobile VoIP, but one of the respondents have doubts about the market potential of such an offer. (5) *I do not believe people are willing to pay anything extra to get bass and treble*. There seems to be an overall agreement among the respondents that Mobile VoIP services have to be user friendly to be adopted among consumers. This concerns both user friendliness when setting up the service and user friendliness in everyday life usage of the service. (5) *It should not be a lot of hassle to make it work the first time* and (5) ….*it should always work*. Seemless handover between WLANs is a critical intrinsic attribute for the service to succeed. One potential problem is when a customer makes a call on its WLAN. However, during the conversation he may move to a part of the house without WLAN coverage. With seemless handover, this

means that he pays the price of an ordinary mobile call, although he believes it is for free. It is important that the consumer is notified about this, so that he does not get any surprises when the bill arrives.

User network attributes

When using a standard application for Mobile VoIP, for example Fring, a precondition for making a Mobile VoIP call is that the person you want to call on IP is using a standard accepted by the application. (4) *So if you can make your community install that Mobile VoIP solution you can in principle call for free over IP*. In particular in the earliest phase the Mobile VoIP diffusion, this limitation of the user network can put some hindrances on the growth of Mobile VoIP. However, a standard application like Fring also makes it possible to connect across various user interfaces, like voice, Skype, and MSN. This may actually extend the user network and trigger the diffusion of Mobile VoIP.

Complement network attributes

An important success factor for Mobile VoIP seems to be availability of complementary services. Examples of such services mentioned by the respondents are presence, video, chat, voicemail, integration of contacts in the phone and in Facebook, etc. (4) *I think some of these services like chat and mail and such services will be common on mobile phones. Everything you are used to from the computer*. One of the respondents also suggested a combination of presence and information about broadband capacity in the various channels a consumer is present. Based on such information it is easier to choose the most effective channel for various forms of communication formats. A more general comment is that new services like Mobile VoIP typically creates incentives for developing new complementary services, and that Mobile VoIP surely will be a source for

innovative services in the years to come. Innovative complements network services will typically only be differentiating for a short period of time – before the service is also included in competitors' offerings.

A detailed overview of the findings is given in Appendix A. This overview table is used as a basis for service comparisons presented and discussed in section 5.

4 CONSUMER BEHAVIOUR STUDY

In this chapter, the method and results of the study of consumer behaviour when assessing the value and intention to adopt Mobile VoIP and Triple play services are presented. The method is presented in section 4.1 and the results are found in section 4.2. To avoid misunderstandings in using the term consumer when referring to potential customers in both consumer and business markets and using the term consumer of both current customers of a service and current non-customers, we here apply the generic term end-user instead.

4.1 Method

To study value assessments and intentions to adopt Mobile VoIP and Triple play services within the research framework presented in chapter 2, it was decided that an investigation of the effects of business model design variations would be of greatest value. In particular, the effects of varying value proposition designs would reveal how end-users value assessments are made, and at the same time, the results would have direct implications for business model design in general and value proposition design in particular. Thus, a quasi-experimental procedure was developed and used.

4.1.1 Procedure

Due to its focus on the effects of business model design on demand side behaviour, a procedure was developed for manipulating the business model design presented to potential respondents. Particular focus was paid to the value proposition of the business model. Based on previous studies, published articles and some exploratory investigations including home visits to media rich homes, we decided to manipulate five elements of the value proposition. These elements were believed to be of

particular relevance to heterogeneous network services. The elements were: Simplicity, price advantage, integration, user network strength and complements network strength.

A workshop was held with project researchers and a professional photographer/producer to identify how scripts could be designed that presented the different elements of the value proposition to potential consumers that lack experience with heterogeneous network services. Scripts were designed for the two services – Mobile VoIP and Triple play including texts presenting the different elements of the value propositions as well as video sequences that could further realistically illustrate the value proposition elements. The script elements designed to represent service attribute differences are presented in Appendix B. It was decided that all value proposition presentations should include all elements, but that propositions should be manipulated by more detailed presentations of each of the value proposition elements at the end of each presentation. Videos were then produced and edited to fit planned scripts. The result consisted of five video presentations of the different value proposition presentations focusing each of the five important attributes of heterogeneous network service attributes. Video presentations were around 1 minute long and were converted and placed on YouTube.com for integration in the procedure exposed to respondents. Links to all video presentations are shown in appendix B.

Recruited respondents were directed to a presentation site where an introduction to the study was given and the video of the presentation was shown along with a text of the audio part of the video. Thus, respondents could see, hear and read the presentation of the value proposition for the services. When the video had been shown, respondents were brought to a questionnaire site covering the measurement

inventories used in the study. The design of all parts of the procedure was integrated using similar colouring, fonts and graphical design. The procedure was pre-tested for the manipulation of the value proposition for Mobile VoIP on the Norwegian site for comparing the prices and terms of the plans of mobile service providers called Telepriser.no. Minor revisions were made to the procedure. The procedure was designed so that the Mobile VoIP study was run first and the Triple play study was run one week after the Mobile VoIP study. Both studies were available to respondents for three ordinary weekdays only. Respondents were allocated by random to any of the five different value proposition presentations for each of the two studies

4.1.2 Samples

A representative sample frame of Norwegian consumers identified by the largest online panel data provider in Norway, Norstat was used. The panel currently includes 65000 respondents from which two sample frames were designed to represent the Norwegian consumer population of age 15+. To make samples representative, Norstat controls the sampling frame by age, sex, education, geography, income and some non-disclosed consumer-related variables. From this sample frame, the sample offered to participate was randomized with 500 potential participants in the Mobile VoIP sample and 550 potential participants in the Triple play sample. Participation was voluntary and was compensated by points that the respondent may later convert into gift cards.

Respondents were thus self-selected respondents from a random sample of a representative population of Norwegian consumers aged 15+ (In Norwegian: 15+, landsrepresentativt). As indicated above, respondents were allocated by random to one of the five value proposition presentations of each of the two services.

From the invitations to participate, 304 responses were collected for the Mobile VoIP study and 310 from the Triple play study, giving response rates of 60.8% and 56.4%, respectively, within the time limit of three days. We consider this more than acceptable. Data were analyzed for careless response. In addition a criterion was applied requiring all respondents to complete the full video presentation and spend more than four minutes on the subsequent questionnaire. The final number of respondents in each sample after removals was 245 for the Mobile VoIP study and 253 for the Triple play study. Sample characteristics of the two studies are shown in table 4.1.

Table 4.1 Sample characteristics – demographic attributes

	Mobile VoIP		Triple play	
Attribute	N	%	N	%
Male	133	54.73	127	50.60
Female	110	45.27	124	49.40
Gender - total	243	100.00	251	100.00
15-19	17	7.00	19	7.54
20-29	55	22.63	40	15.87
30-39	48	19.75	45	17.86
40-49	28	11.52	41	16.27
50-59	58	23.87	51	20.24
60+	37	15.23	56	22.22
Age – total	243	100.00	252	100.00
Primary	14	5.79	16	6.35
Secondary	69	28.51	94	37.30
University L	84	34.71	82	32.54
University H	75	30.99	60	23.81
Education - total	242	100.00	252	100.00

When compared to the general characteristics of the Norwegian consumer population and considering the size of the samples, we conclude that the samples seem to appropriately represent the Norwegian consumer population at least when it comes to simple demographic attributes.

4.1.3 Measures

Multiple measures were designed to capture the following theoretical constructs: Ease of use, usefulness, perceived price, compatibility, service quality, service integration, user network strength, complements network variety, subjective norm, behavioural control, attitudes, customer value, intention to use the service, experience and mode of adoption. Of these, the first 10 are considered independent, the next 3 are considered dependent, and the others moderating. In addition, single measures were used to capture 3 attributes of the consumer's household and social network, gender, age and education.

Both usefulness and ease of use have been applied in numerous studies and their validity is well proven (Venkatesh et al., 2003). *Usefulness* was measured using three items covering the original dimensions of time saving, improvement and usefulness suggested by Davis (1989). *Ease of use* was measured using four items developed from adapting the original items of Davis et al. (1989) to our setting.

The measure of *perceived price* was developed from the literature on customer value which relates perceived advantages to perceived price through a measure or manipulation of perceived relative price (Zeithaml, 1988). Thus, it included one item reflecting the relative price advantage of the services as well as two items from more reflective measures of perceived price (Voss, Parasuramen og Grewal (1998).

Compatibility is one of the intrinsic attributes suggested by Rogers (1995). It has also been defined in information systems research as "*the degree to which an innovation is perceived as being consistent with existing values, needs, and past*

experiences of potential adopters" (Chin and Gopal, 1995). It has been applied in numerous studies of technology adoption (Moore and Benbasat, 1991; Chin and Gopal, 1995). Our measure is based on adapting the items of Moore and Benbasat (1991) to the context of our services. For Mobile VoIP, for example, the adaptation was based on Wang et al. (2005) and Wu and Wang (2004).

Service quality has been extensively studied in marketing research and information systems research (Zetihaml, 1988; Zeithaml, Parasuraman and Malhotra, 2002). Recently, service quality of mobile services has also been given some attention (Nordman and Liljander, 2003). The main problem with these approaches is that they include complex, formative items of service quality. Such measures limit the possibilities for structural analysis and require large measurement instruments. Thus, the development of a reflective measure was prioritized in this study. A measure very similar to the reflective measure of Cronin, Brady and Hult (2000) was applied.

Service integration reflects the perceived integration between components of a service and is related to compatibility (Chin and Gopal, 1995) as well as a source of relative advantage for heterogeneous network services. It has, to our knowledge however, never been operationalized before. A simple two-item measure was designed primarily to test the manipulation of the value proposition.

Our measure of *user network strength* is based on the ideas of a perceived, relative version of the "mindshare" concept used by Gallaugher and Wang (2002) and consists of items reflecting perceived size of the relevant user base. Similar items have been used by e.g. Frels et al. (2003).

Several authors have measured variety-dimensions of complementary services, such as the current size of the complements network (Frels et al., 2003), the availability of complementary services or goods (Schilling, 2003) or the integration of complementary products (Nambisan, 2002). Both complements network size and availability are closely related to the variety of complementary goods studied in the network effects literature (Cottrell and Koput, 1998, Gallaugher and Wang, 2002). Our measure of *complements variety* was adapted from the measure of the size of the complements network used by Frels et al. (2003).

We measured *subjective norm* using three items that were almost identical to the items used by Mathieson (1991) and Battacherjee (2000). A somewhat simpler version of the measure was used by Venkatesh and Davis (2000). The measure of *behavioral control* was almost identical to the measure applied by Battacherjee (2000) and Taylor and Todd (1995). Both measures were adapted to the context of the services.

We measured *attitude* toward use using three bipolar adjectives that indicated different aspects of the subjects' attitude toward use. The items were similar to those used by Davis (1989), Taylor and Todd (1995), and Battacherjee (2000). Finally, we measured *intention to use* using a two-item scale that we adapted from Battacherjee's (2000) and Mathieson's (1991) studies.

Consumers' or customers' *perceived value* of a service or product has been investigated applying concepts such as perceived customer value (Chen and Dubinsky, 2003), consumer perceived value (Sweeney and Soutar, 2001), service value (Bolton and Drew, 1991), experiential value (Mathwick, Malhotra and Rigdon, 2001), perceived acquisition value (Grewal, Monroe and Krishnan, 1998)

and perceived value of a service (Petrick, 2002), just to mention some examples. Our measures of perceived value and anticipated value were founded in the literature on perceived customer value (Zeithaml, 1988). Rather than using a formative scale like Sweeney and Soutar (2001), perceived value was measured using three items reflecting, perceived total value (acquisition value), perceived value relative to offer, and perceived value relative to requirements.

Experience with the service category was measured using three items partly adapted from Bruner and Kumar (2000) that we have used and tested in previous studies of Internet service adoption and consumer behaviour (Nysveen and Pedersen, 2004; Nysveen and Pedersen, 2005) .

Adoption may be studied in a macro perspective (e.g. Rogers, 1995) or in a micro perspective as acceptance (Davis, 1989) but in both perspectives, adoption of a technology is either seen as unrelated to existing technology or seen as replacing it. From previous studies, we have seen how a new technology is adopted to supplement and also sometimes complement and increase the use of existing technology (e.g. Nysveen et al, 2005). Thus, we argue that technology may be adopted in different modes varying from adoption unrelated to existing technology or services to adoption substituting existing technology or services. Because almost all mobile and online services in some way relate to existing services the mode of adoption covering a completely unrelated service seem irrelevant. Three *adoption modes* where thus defined; substitution, supplementary and complementary modes. Two-item measures covering the three modes were designed as a first attempt to empirically cover this issue in the technology adoption literature.

Gender, age and education were measured with single item measures applying the same scales as in Nysveen et al., (2005 and Thorbjørnsen et al., 2008). Three attributes of the consumer's *household and social network* were included applying standard items from the Population and Household Census Handbook of Statistics Norway.

Most of the above items have previously been used and tested in adapted form to study the value and adoption of various mobile and Internet services by the authors of this report (e.g. Nysveen et al., 2005; Thorbjørnsen et al., 2008). All items are shown in Appendix C (in Norwegian).

To investigate the conceptual structure of the items, exploratory factor analysis was conducted. This analysis was conducted for the items of the independent, mediating and dependent variables separately.

Independent variables

The analysis of the independent variable items showed 8 factors with eigenvalue above 1 explaining 72% of the variance in the items. The items showed a consistent structure of loadings and the 8 factors matched the 10 hypothetical constructs by grouping together items measuring complements variety and integration and items measuring ease of use and compatibility. Within this structure the highest cross-construct loading was found for one of the ease of use items at 0.38 and the lowest inter-construct loading was found for one of the complements variety items at 0.49. The second lowest inter-construct loading was found for the above mentioned ease of use at 0.57.

Using scree plot as a recommended procedure for identifying the relevant number of factors (Hair et al., 2006, p. 120), a drop in eigenvalue is found between 10 and 11 factors from 0.82 to 0.63, suggesting that the next number of factors to use is 10. This corresponds to the theoretically proposed number of constructs as well. Not surprising, this leads to a separation of the two above mentioned factors into separate factors for ease of use, compatibility, complements variation and integration. Now, the solution explains 78 % of the variance and the highest cross-construct loading is found for one of the complements variety items at 0.33 and the lowest inter-construct loading is found for the above described ease of use item at 0.62. The results are illustrated in table 4.2. All in all, these findings indicate that the proposed theoretical structure of items should be retained and that no items should be excluded from further analysis.

The analysis reported in table 4.2 includes data from two services, and small variations in wording have been used to adapt measures to services. Thus, separate analysis of item structure at the service level was conducted. Separate analysis of the Mobile VoIP data showed a similar structure to the analysis of all data. The Triple play data, on the other hand, showed a somewhat different structure of loadings. As for all the analysis of all data, 8 factors where extracted in the exploratory analysis, but the structure of loadings revealed problems with discriminating ease of use and complements variety as separate constructs. Confirmatory analysis using 10 factors showed the highest cross-construct loading at 0.51 for one of the user network items and the lowest inter-construct loading for the above described complements variety item at 0.49. Thus, for separate analyses, these two items could be recommended removed, while when using the complete dataset, no items should be removed. To include these considerations in further analysis, the analyses will be conducted with the full item sets. For comparative

analyses across service types, the consequences of dropping low validity and low reliability items will be reported.

Table 4.2 Factor analysis results – all data (N=498)*

	Fact. 1	Fact. 2	Fact. 3	Fact. 4	Fact. 5	Fact. 6	Fact. 7	Fact. 8	Fact. 9	Fact. 10
Eigen-values	9,03	2,53	2,50	2,12	1,54	1,51	1,27	1,16	0,96	0,82
Var. expl. (%)	30,09	38,53	46,85	53,93	59,08	64,12	68,36	72,22	75,40	78,14
Eou1	0,19	0,17	0,12	0,06	0,81	0,01	0,09	0,23	0,14	0,08
Eou2	0,14	0,21	0,09	0,06	0,83	0,02	0,17	0,10	0,08	0,11
Eou3	0,23	0,20	0,08	0,01	0,62	0,07	0,26	0,24	0,12	0,03
Useful1	0,74	0,08	0,08	0,13	0,13	0,13	0,07	0,09	0,25	0,00
Useful2	0,80	0,18	0,02	0,09	0,12	0,21	0,10	0,03	0,02	0,10
Useful3	0,82	0,13	0,06	0,15	0,13	0,12	0,00	0,07	0,14	0,14
Useful4	0,79	0,17	0,17	0,10	0,17	0,10	0,07	0,10	0,13	0,10
Price1	0,04	0,05	0,89	0,11	0,08	0,04	0,00	0,19	0,03	0,02
Price2	0,10	0,10	0,88	0,07	0,07	0,06	0,03	0,15	0,06	0,05
Price3	0,14	0,12	0,79	0,02	0,08	0,14	0,04	0,12	0,06	0,13
Comp1	0,11	0,16	0,17	0,05	0,22	0,04	-0,02	0,73	0,10	0,17
Comp2	0,02	0,05	0,21	0,07	0,12	0,18	0,03	0,81	0,00	0,07
Comp3	0,13	0,21	0,15	0,00	0,13	0,02	0,13	0,72	0,22	0,07
Vari1	0,33	0,14	0,16	0,12	-0,06	0,02	0,06	0,05	0,29	0,63
Vari2	0,20	0,09	0,09	0,07	0,10	0,18	0,02	0,16	0,29	0,63
Vari3	-0,03	0,10	0,02	0,08	0,14	0,22	0,01	0,12	-0,03	0,80
Qual1	0,24	0,81	0,08	0,10	0,22	0,04	0,08	0,17	0,09	0,11
Qual2	0,16	0,87	0,13	0,10	0,16	0,08	0,09	0,16	0,10	0,11
Qual3	0,14	0,86	0,09	0,09	0,15	0,12	0,05	0,09	0,10	0,08
Int1	0,23	0,16	0,16	0,03	0,16	0,12	0,04	0,14	0,81	0,19
Int2	0,26	0,11	-0,01	0,05	0,15	0,15	0,03	0,15	0,82	0,17
User1	0,25	0,13	0,02	0,07	0,01	0,75	0,11	0,05	0,26	0,07
User2	0,14	0,03	0,15	0,16	0,08	0,85	0,02	0,06	-0,04	0,13
User3	0,14	0,07	0,07	0,18	0,00	0,82	-0,03	0,13	0,10	0,19
Norm1	0,16	0,08	0,05	0,81	-0,01	0,07	0,14	0,03	0,14	0,11
Norm2	0,15	0,09	0,07	0,90	0,08	0,18	0,07	0,01	-0,02	0,07
Norm3	0,10	0,08	0,07	0,90	0,06	0,14	0,10	0,07	-0,03	0,04
Bcont1	0,07	0,08	-0,07	0,10	0,38	0,06	0,82	-0,06	-0,01	0,03
Bcont2	0,07	0,08	-0,08	0,20	0,34	0,08	0,80	0,04	-0,06	-0,02
Bcont3	0,07	0,06	0,20	0,07	-0,12	-0,03	0,80	0,13	0,14	0,06

* Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Values above 0.6 shaded

Exploratory analysis of the two dependent variables produced one factor explaining 77% of the variance, but when extracting two factors the pattern of factor loadings corresponded to the two hypothesized constructs of intention and value. For the adoption mode variable, we originally theorized that three modes could be identified; substitution, supplement and complement modes. Exploratory analysis revealed two factors explaining 76 % of the variance and facto loadings grouping substitution mode as something different from supplement and complement mode. Trying to confirm the hypothesized structure resulted in factor loadings not corresponding to theorized constructs. Thus, we conclude that two modes of adoption could be identified; substitution and complement modes, where complement mode includes supplement mode.

To further investigate the reliability and validity of items, confirmatory factor analysis was conducted of the measurement model underlying the study. Here, we focus on the measurement model of the independent variables. Later, measurement model data is reported for all path analyses as well. Following the most recent recommendations of Hair et al. (2006), the final measurement model of independent variables included 10 constructs, of which three where measured with 2 items, six with 3 items and one with 4 items. None of the items that were discussed in the exploratory analysis above were identified as problematic. Instead, two items, one measuring complement variety and one measuring behavioural control, were removed. The arguments for removing the two items were methodological as well as theoretical. One of the items measured the variety of service providers, an item that mainly is of relevance in open network contexts. The

other item measured skills and resources as part of behavioural control and could be interpreted as being a formative indicator rather than a reflective item.

Table 4.3 Construct validity – confirmatory factor analysis results – all data (N=498)

	EOU	Use	Price	Comp	Vari	Qual	Int	User	Norm	BCon
Variance extracted	65,8	65,2	69,3	53,5	52,1	77,7	74,7	63,6	74,8	81,2
Construct reliability	0,92	0,91	0,93	0,89	0,83	0,96	0,93	0,89	0,90	0,90
Eou1	0,86									
Eou2	0,85									
Eou3	0,71									
Useful1		0,74								
Useful2		0,79								
Useful3		0,85								
Useful4		0,85								
Price1			0,87							
Price2			0,89							
Price3			0,73							
Comp1				0,75						
Comp2				0,71						
Comp3				0,73						
Vari1					0,71					
Vari2					0,73					
Qual1						0,87				
Qual2						0,95				
Qual3						0,82				
Int1							0,86			
Int2							0,87			
User1								0,71		
User2								0,82		
User3								0,86		
Norm1									0,72	
Norm2									0,96	
Norm3									0,90	
Bcont1										0,89
Bcont2										0,92

In table 4.3, results from a confirmatory factor analysis of the measurement model are shown. Model X^2 is 610.5 with 305 degrees of freedom giving a X^2 / d.f of 2.00. RMSEA is 0.045 and CFI is 0.96, all showing good measurement model fit.

As seen from table 4.3 all factor loadings are above 0.7, all variances extracted are above 0.5 and construct reliability is well above 0.7 for all constructs. Thus, convergent validity is acceptable. Discriminant validity is examined by comparing the variances extracted reported in table X to all interconstruct squared correlations. Table 4.4 shows these correlations and repeats the extracted variances along the table diagonal.

Table 4.4 Discriminant validity (N=498)

	EOU	Use	Price	Comp	Vari	Qual	Int	User	Norm	BCon
EOU	0,66									
Use	0,26	0,65								
Price	0,09	0,10	0,69							
Comp	0,32	0,16	0,26	0,54						
Vari	0,18	0,37	0,14	0,27	0,52					
Qual	0,30	0,24	0,11	0,25	0,21	0,78				
Int	0,22	0,35	0,06	0,24	0,49	0,17	0,75			
User	0,04	0,22	0,07	0,12	0,24	0,08	0,15	0,64		
Norm	0,05	0,14	0,05	0,04	0,11	0,08	0,03	0,17	0,75	
BCon	0,26	0,07	0,00	0,03	0,03	0,09	0,03	0,03	0,10	0,81

From table 4.4 we find that all extracted variances are higher than the interconstruct squared correlations. For the relationship between Complements variety and Integration, we find, however, that the difference is only 0.03. This suggests that even though discriminant validity is acceptable according to the rules of Hair et al (2006), structural analysis should be conducted with attention to the relationship between these constructs. Based on the above reported indicators, we conclude that the construct validity of the measurement model is acceptable.

Dependent variables

A similar procedure was followed for the mediating and dependent variables, Attitude, Intention and Customer value. Again, using scree plot analysis, three factors were identified with a factor pattern corresponding to the structure of the items explaining 88.4% of the variance. Thus, measurement model analysis was conducted. The results are shown in table 4.5.

Table 4.5 Construct validity – confirmatory factor analysis results – all data (N=498)

	Attitude	Intention	Value
Variance extracted	78,73	88,27	80,01
Construct reliability	0,93	0,93	0,94
Att1	0,86		
Att2	0,89		
Att3	0,92		
Intent1		0,95	
Intent2		0,93	
Value1			0,92
Value2			0,88
Value3			0,89

The measurement model fit is characterized by a X^2 of 45.6 with 17 degrees of freedom giving a X^2 / d.f of 2.68. RMSEA is 0.058 and CFI is 0.99, all showing good measurement model fit. Furthermore, analysis of discriminant validity showed no interconstruct squared correlations higher than the variance extracted for each factor individually. Thus, we concluded that the construct validity of the measurement model for the mediating and dependent variables is acceptable.

4.2 Results

Applying the results of the analysis of the measurement model for independent and dependent variable items, variables were designed by summed scales using the factor loadings of table 4.3 as weights for the independent variables and the weights of table 4.5 for the mediating and dependent variables. In addition, the individually interesting variables of Supplier variety and Resources, which are single item measures of supplier variety and the economic and personal resources, are also shown. The descriptive statistics of the simple summed scale variables are shown in table 4.6.

Table 4.6 Descriptive statistics

	Mean	St . dev.	N
Ease of use	3,50	0,64	492
Usefulness	3,48	0,74	481
Price	3,25	0,66	488
Compatibility	3,41	0,55	490
Complement variety	3,91	0,58	490
Quality	3,38	0,64	466
Integration	3,76	0,64	497
User Network	3,14	0,69	494
Norm	2,31	0,88	491
Behavioural control	2,72	0,91	494
Supplier variety	3,44	0,71	491
Resources	3,28	0,98	493
Attitude	3,55	0,80	471
Intention	2,41	0,99	495
Value	2,69	0,91	485

The presentation of the rest of the results is organized by first presenting the results from our value proposition and service manipulations. Second, the relationships between manipulations and dependent variables are presented. Third, results of simple regressions are presented. Fourth, results from structural equations modelling, and finally, comparisons between previous studies applying the same

measurement inventories and the current results are shown. For each sub-sections, results on Triple play and Mobile VoIP services are presented.

4.2.1 Analyses of manipulations

As described in section 4.1, the procedure used manipulations of value propositions. This was both to test if manipulation of simple elements in the value proposition were reflected in perceptions of service attributes and in perceived value and intention to adopt, as well as to ensure a sufficiently broad operationalization of the service propositions of two services that were relatively new to the average service customers. Thus, we first conduct manipulation checks by studying the effects of the manipulation on service perceptions and second, we investigate the potential effect of the manipulations on dependent variables.

Value proposition manipulation checks

As described above, manipulations were designed for five attributes of the value proposition of the service; Ease of use, Integration, Price, User network and Complements network. In table 4.7, the results of the analysis of variance of the manipulated group versus the other groups are shown.

Table 4.7. Attribute manipulation checks – analysis of variance

	Mean manipulated	Mean other	F; d.f.
Ease of use	3.47	3.50	0.27; 491
Integration	3.74	3.76	0.08; 496
Price	3.37	3.21	4.66*; 487
User network size	3.34	3.10	9.80**; 493
Complements network var.	3.95	3.90	0.53; 489
Supplier variety	3.63	3.40	7.95**; 490

* Indicate significance at $p<0.05$ and ** at $p<0.01$

Table 4.7 shows that priming Price and User network size were the only manipulations checks that consistently held when analysing aggregate data. This suggests the priming of Ease of use, Integration and Complements network were too weak or that these attributes were not relevant attributes in end-users' perceptions of heterogeneous network services. The priming of Complement network was, however, investigated using the Supplier variety variable as an alternative manipulation check. This proved highly significant. Thus, it seems the priming conducted reflects supplier variety and that the subjects perceive this priming as an attribute difference in supplier variety. Thus, the results show that priming of value propositions affects the perception of attributes at least for some attributes, and we may conclude that a sufficiently broad operationalization of the value propositions of the two services where made. This reduces the likelihood of finding significant effects but strengthens the validity of the findings once they are made.

The analyses were also conducted separately for each of the two services. The results showed that the findings for Price were just not significant for Mobile VoIP (F=2.46, d.f.=242) but significant at the 10% level for Triple play (2.85, d.f.=244). This suggests the increased variance of separate analyses weakens the manipulation check, but that the check holds at the aggregate level. For User network size the manipulation is highly significant for the Triple play service (F=10.35**; d-f-=250) but not significant (F=1.52, 242) for Mobile VoIP. This is surprising considering that Mobile VoIP is a communication service believed to be sensitive to the size and quality of the user network. Finally, when conducting separate analyses of the priming of Complements network variety when using the Supplier variety variable as the manipulation check, we found differences in perceptions for the Triple play

service (F=20.6; d.f.-=246), but not for the Mobile VoIP service (F=0.64; d.f.=243).

The analyses of variance were also conducted for all other independent variables and for each of the two services investigated separately. These analyses revealed that for the manipulation of Ease of use, a significantly larger Behavioural control was perceived for the group that was not primed for Ease of use than for the group that was primed. This finding was significant at the 5% level (F=4.01; d.f.=249) for the Triple play service separately and at the 10% level (F=3.34; d.f.=493) for the complete data set (both services included). This suggests priming ease of use draws subjects' attention to perceptions of behavioural control and leads to a lower perceived behavioural control. When investigating the resources component of traditional behavioural control, the same results were also found for Mobile VoIP (F=5.40; d.f.=241), indicating that priming ease of use also for this service draws attention to problems of perceived resources (both skills and financial resources) required to manage using the service. For the manipulation of Price, a significant difference in subjective norm was found for the complete data set (F=4.12*; d.f.=490) and for the Mobile VoIP service separately (F=9.1**; d.f.=242). The direction of this finding was positive indicating that priming Price leads to greater attention to subjective norms. This suggests that subjects feel that when the price is focused they pay more attention to the influence of other people. This may be because they feel that when price is focused they are given an offer, and that makes them think that it is likely that other people would also be more likely to accept the offer. This is, however, not consistent across services.

For User network size, we found a difference in perceived usefulness at the 10% level (F=3.03; d.f.=480), but this finding was not significant when analysing

services separately. However, a significant difference at the 5% level was found for Ease of use for the Triple play service (F=4.00: d.f.=248), suggesting that when priming that all types of users can be called in a phone solution of a Triple play service, Ease of use increases. For Complements network, differences were found in perceived usefulness (10% level) and price (5% level) for the Triple play service (F=3.10; d.f.=241; F=4.69, d.f.=244). When investigating means, however, these were found to be negative for the Complements network variable, suggesting that when priming complements network issues in Triple play services, perceived usefulness and price is affected negatively. This may be due to the priming drawing attention to a potential problem of Triple play services in complements network issues, but these problems do not seem to be related to compatibility (no differences in perceptions) or lack of behavioural control (no differences in perceptions).

Table 4.8 Service manipulation checks – analysis of variance

	Mobile VoIP	Triple play	F; d.f.
Ease of use	3.45	3.55	2.99*; 491
Usefulness	3.38	3.58	8.73***; 480
Price	3.33	3.16	7.61***; 487
Compatibility	3.45	3.37	2.35; 489
Complement variety	3.97	3.86	4.22**; 489
Quality	3.27	3.49	14.05***; 465
Integration	3.72	3.79	1.96; 496
User Network	3.16	3.12	0.38; 493
Norm	2.29	2.33	0.34; 490
Behavioural control	2.61	2.83	7.11***; 493
Supplier variety	3.42	3.47	0.65; 490
Resources	3.26	3.30	0.28; 492

* Indicate significance at p<0.10, ** at p<0.05 and *** at p<0.01.

In addition, the five manipulations where made for two different services, Mobile VoIP and Triple play services. Thus, it is interesting to investigate if these service

manipulations where perceived as different for the independent variables. The results are shown in table 4.8.

From table 4.8 we find that the perception of service attributes differs significantly between Mobile VoIP and Triple play services for Ease of use, Usefulness, Price, Complements network variety, Quality and Behavioural control. Thus, Triple play services are perceived as easier to use, more useful, of higher quality and subjects feel they are more in control of these services. On the other hand, Mobile VoIP services are perceived as more favourably priced and offering a greater variety of complementary services. From these findings it seems reasonable to conclude that the two services are perceived as very different. A consistent pattern of differences indicating that the two services belong to more abstract categories of heterogeneous network services is more difficult to identify.

Dependent variables and manipulations

Despite the problems with the manipulation checks above, we investigated any differences in the means of the dependent variables through analysis of variance. The results are shown in table 4.9.

From table 4.9 we identify a significant effect of Price on Attitudes and Value, but no effect on Intentions.

Again, the analyses shown in table 4.9 were conducted for the complete data set as well as for each of the services separately. No differences were found in the material for the priming of Ease of Use and Integration.

Table 4.9 Analysis of variance – mediating and dependent variables

	Attitude (d.f.=470)	Value(d.f.=484)	Intention(d.f.=494)
Ease of use	M_1=3.47 M_0=3.57 F=1.00	M_1=2.56 M_0=2.72 F=2.13	M_1=2.34 M_0=2.42 F=0.54
Integration	M_1=3.57 M_0=3.54 F=0.09	M_1=2.67 M_0=2.70 F=0.10	M_1=2.50 M_0=2.38 F=1.26
Price	M_1=3.68 M_0=3.51 F=3.24*	M_1=2.84 M_0=2.65 F=3.37*	M_1=2.47 M_0=2.39 F=0.58
User network	M_1=3.64 M_0=3.53 F=1.32	M_1=2.69 M_0=2.69 F=0.00	M_1=2.36 M_0=2.42 F=0.20
Complements network	M_1=3.37 M_0=3.59 F=5.39**	M_1=2.70 M_0=2.69 F=0.00	M_1=2.34 M_0=2.42 F=0.57
Service (1=Mobile VoIP, 0=Triple play)	M_1=3.50 M_0=3.60 F=1.85	M_1=2.60 M_0=2.78 F=4.39**	M_1=2.41 M_0=2.41 F=0.00

* Indicate significance at p<0.10, ** at p<0.05 and *** at p<0.01. Table shows group means, F-values and degrees of freedom.

For Price, the differences in means shown in table 4.9 were only found on Attitudes for the Triple play service when analyzed individually (F(Attitude)=3.78; d.f.=234). For the rest of the dependent variables and for Mobile VoIP, no differences were found. For Complements network, the findings of table 4.9 were replicated (significant difference only in Attitude, F=5.48; d.f.=235) for the Mobile VoIP service, but not for the Triple play service.

Included in table 4.9 are also the results from investigating differences in the mediating and dependent variables across services (last row). These results show that Triple play is perceived as a significantly more valuable service, but despite these differences, subjects have no higher intentions to use the Triple play services than the Mobile VoIP services. This may be due to perceptions of differences in

true availability of the services, but we have not measured any variables confirming such a proposition.

The above findings indicate that an interaction analysis should be conducted including priming of attributes as well as manipulation of services. In table 4.10, the results of this analysis are shown.

Table 4.10 Analysis of variance – mediating and dependent variables

	Attitude (d.f.=470)	Value(d.f.=484)	Intention(d.f.=494)
	R^2=0.00	R^2=0.01	R^2=0.00
Ease of use	F=1.01	F=2.51	F=0.53
Service	F=0.30	F=2.30	F=0.03
Interaction	F=0.76	F=0.06	F=0.10
	R^2=0.01	R^2=0.01	R^2=0.00
Integration	F=0.09	F=0.08	F=1.24
Service	F=0.34	F=1.87	F=0.20
Interaction	F=0.91	F=0.34	F=0.63
	R^2=0.01	R^2=0.02	R^2=0.00
Price	F=3.03*	F=3.22*	F=0.62
Service	F=2.71*	F=2.81*	F=0.28
Interaction	F=0.96	F=0.00	F=0.78
	R^2=0.01	R^2=0.01	R^2=0.00
User network	F=1,27	F=0.00	F=0.26
Service	F=0.90	F=1.54	F=0.69
Interaction	F=0.03	F=0.36	F=1.81
	R^2=0.02	R^2=0.01	R^2=0.00
Complements network	F=5.41**	F=0.01	F=0.57
Service	F=2.74	F=6.43**	F=0.00
Interaction	F=0.89	F=2.07	F=0.01

* Indicate significance at p<0.10, ** and p<0.05. Table shows R^2, F-values and degrees of freedom.

Table 4.10 shows that there are no significant interaction effects, and that all effects are simple main effects. Only for Value and Complements network variety are there any F-values of some magnitude for the interaction effect, but the F-value is not significant. This indicates that service manipulations and priming effects may

be considered separately as simple main effects. Thus, the results reported above for the individual services and for each of the priming variables are relevant.

4.2.2 Simple regressions

The measurement model analysis has shown us that independent variables are correlated. Thus, traditional multiple regression analysis should be avoided, and structural equation modelling is preferred when analysing the relationship between independent and dependent variables. However, simple regressions may be used to investigate simple relationships between individual independent variables and dependent variables. In table 4.11, the results of these analyses are shown.

From table 4.11 we find all independent variables significantly influences Value and Intention. When ranking individual independent variables by their R^2, the three most important independent variables for customer value are Usefulness, Service quality and Norm, whereas the three most important variables for explaining intention to use a service are Norm, Usefulness and Behavioural control. Thus, customer value seems to be best explained by a somewhat different variable set than intention to use. We also find that explained variance in general is much higher for Value than for Intention. Thus, explaining Value is easier than explaining Intentions. However, both dependent variables are relevant in a service adoption perspective. Often, services are launched and marketed with the intention of getting services adopted over time. In such situations two routes are possible, a route from attitudes through value to intention or a route from attitudes through intention to value. The choice of route depends on how important first hand experience with a service is for its adoption and continued use.

Table 4.11 Individual regression analyses

	Value	Intention
Ease of use	M: R^2=0.12, t=5.54** T: R^2=,0.24 t=8.68** A: R^2=0.18, t=10.14**	M: R^2=0.03, t=2.57* T: R^2=0.15, t=6.62** A: R^2=0.08, t=6.48**
Usefulness	M: R^2=0.39, t=12.10** T: R^2=,0.36 t=11.44** A: R^2=0.38, t=16.85**	M: R^2=0.22, t=8.14** T: R^2=0.21, t=8.02** A: R^2=0.21, t=11.26**
Price	M: R^2=0.07, t=4.46** T: R^2=0.08, t=4.68** A: R^2=0.07, t=5.96**	M: R^2=0.04, t=3.27** T: R^2=0.07, t=4.29** A: R^2=0.05, t=5.06**
Compatibility	M: R^2=0.09, t=4.96** T: R^2=0.08, t=4.80** A: R^2=0.09, t=6.67**	M: R^2=0.03, t=2.92** T: R^2=0.06, t=3.91** A: R^2=0.04, t=4.80**
Complement variety	M: R^2=0.21, t=8.07** T: R^2=0.22, t=8.33** A: R^2=0.21, t=11.18**	M: R^2=0.07, t=4.42** T: R^2=0.12, t=5.75** A: R^2=0.09, t=7.17**
Quality	M: R^2=0.21, t=7.76** T: R^2=0.29, t=9.18** A: R^2=0.26, t=12.70**	M: R^2=0.06, t=3.70 T: R^2=0.22, t=8.22** A: R^2=0.12, t=8.16
Integration	M: R^2=0.13, t=5.97** T: R^2=0.24, t=8.91** A: R^2=0.19, t=10.52**	M: R^2=0.06, t=4.12** T: R^2=0.05, t=3.77** A: R^2=0.06, t=5.54**
User Network	M: R^2=0.12, t=5.70** T: R^2=,0.14 t=6.45** A: R^2=0.13, t=8.50**	M: R^2=0.07, t=4.41** T: R^2=0.09, t=5.00** A: R^2=0.08, t=6.67**
Norm	M: R^2=0.29, t=9.77** T: R^2=0.16, t=6.84** A: R^2=0.22, t=11.62**	M: R^2=0.24, t=8.82** T: R^2=0.22, t=8.25** A: R^2=0.23, t=12.01**
Behavioural control	M: R^2=0.12, t=5.88** T: R^2=0.20, t=7.84** A: R^2=0.17, t=9.86**	M: R^2=0.14, t=6.34** T: R^2=0.20, t=7.86** A: R^2=0.17, t=9.96**
Supplier variety	M: R^2=0.06, t=4.05** T: R^2=0.08, t=4.62** A: R^2=0.07, t=6.21**	M: R^2=0.02, t=2.49* T: R^2=0.06, t=3.91** A: R^2=0.04, t=4.65**
Resources	M: R^2=0.08, t=4.67** T: R^2=0.12, t=5.97** A: R^2=0.10, t=7.51**	M: R^2=0.14, t=6.35** T: R^2=0.13, t=6.30** A: R^2=0.14, t=8.91**

* Indicate significance at p<0.05 and ** at p<0.01. M=Mobile VoIP, T=Triple play, A= All data

We also find that the four most important variables for customer value for Mobile VoIP are Usefulness, Norm, Quality and Complements variety, whereas for Triple play they are Usefulness, Quality, Integration and Ease of use. A similar pattern is

found for Intention where Norm and Usefulness are particularly important for Mobile VoIP but Norm and Quality are the most important for Triple play. Thus, there seem to be differences in the explanatory power of different independent variables for the two different services.

4.2.3 Structural model analysis

The individual regression analyses of table 4.11 are of limited relevance because perceived attributes always occurs in combined sets and are systematically correlated in a factorial model. Thus, structural equations modelling will give us a much better picture of the influential pattern of service attributes on attitudes, value and intentions. We start by modelling these structural relationships in a model using data from both services. Because of the two dependent variables, two models are of relevance. The two models resulting from the analysis are shown in figure 4.1.

Figure 4.1 shows standardized regression coefficients, level of significance and explained variance of the two models. The model fit was acceptable for both models. The Value-model showed a X^2 of 723.7 with 379 degrees of freedom giving a X^2 / d.f. of 1.91, an RMSEA of 0.043 and CFI of 0.96. The Intention model showed a X^2 of 681.3 with 350 degrees of freedom giving a X^2 / d.f. of 1.95, an RMSEA of 0.044 and CFI of 0.96. From figure 4.1 we find that the model explains 63% of the variance in Value and 45% of the variance in Intention. Thus, the model best explains variance in Value. We also see that the models are slightly different, with Usefulness, Quality, Complements variety, Norm and Behavioural control significantly influence Value, whereas Ease of use, Usefulness, Quality, Complements variety, Norm and Behavioural control significantly influence Intention.

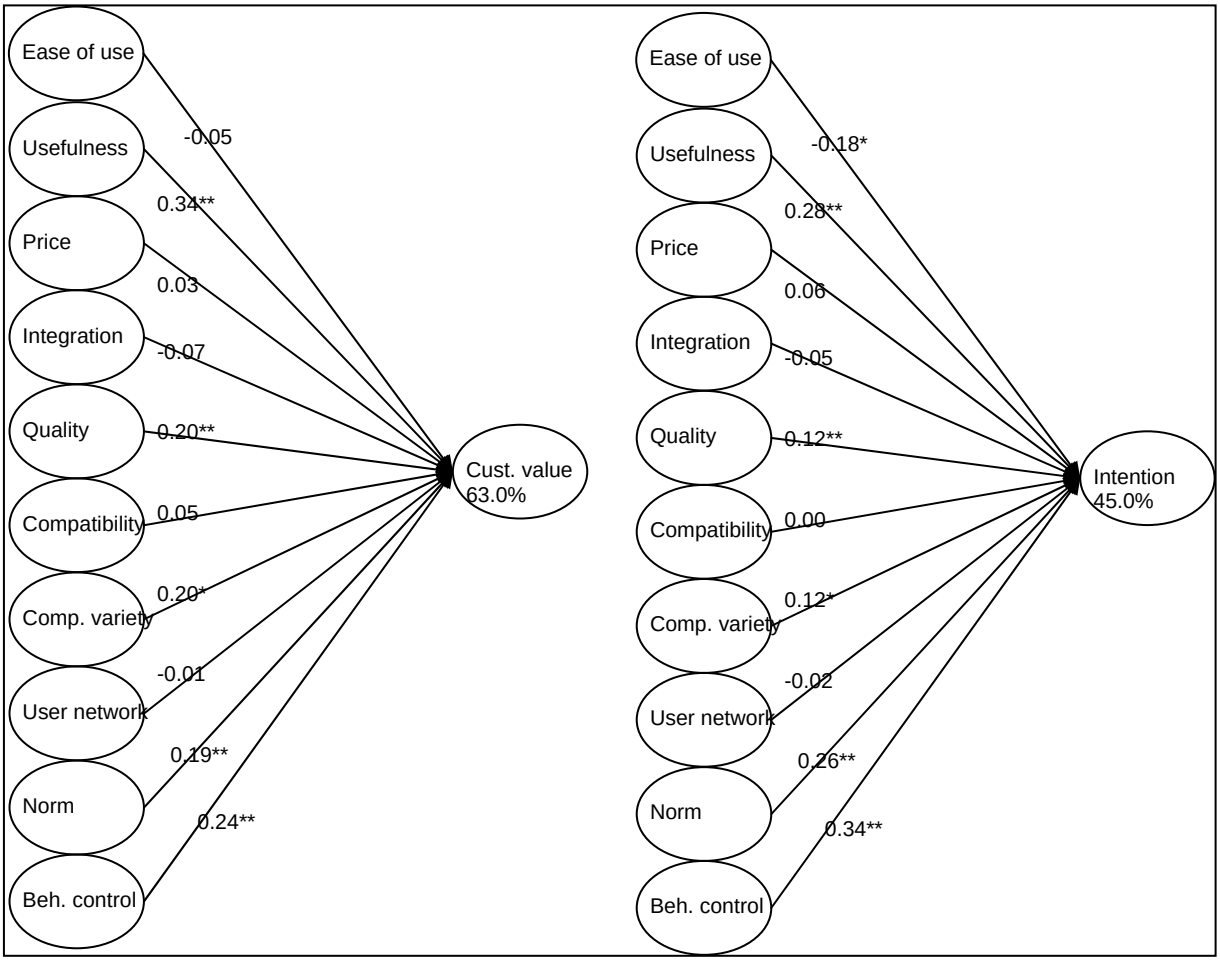


Figure 4.1 Path models - all data - customer value and intention to use.

The difference is the significance of Ease of use, which in the Intention-model also has a negative influence on Intentions. This is very difficult to explain, and is possibly due to a complex relationship between Ease of use, perceptions of Quality and Behavioural control. This suggests the model should be reduced to produce a more parsimonious basic model. The results also suggest modelling the two services separately. We first show the corresponding model for the Mobile VoIP services in figure 4.2.

The model fit was acceptable for both models. The Value-model showed a X^2 of 571.3 with 379 degrees of freedom giving a X^2 / d.f. of 1.51, an RMSEA of 0.046 and CFI of 0.96. The Intention model showed a X^2 of 523.1 with 350 degrees of freedom giving a X^2 / d.f. of 1.50, an RMSEA of 0.045 and CFI of 0.96. From figure 4.2 we find that the model explains 66.7% of the variance in Value and 51.2% of the variance in Intention. Thus, we see that the separate model shows better fit and explains more of the variance in dependent variables.

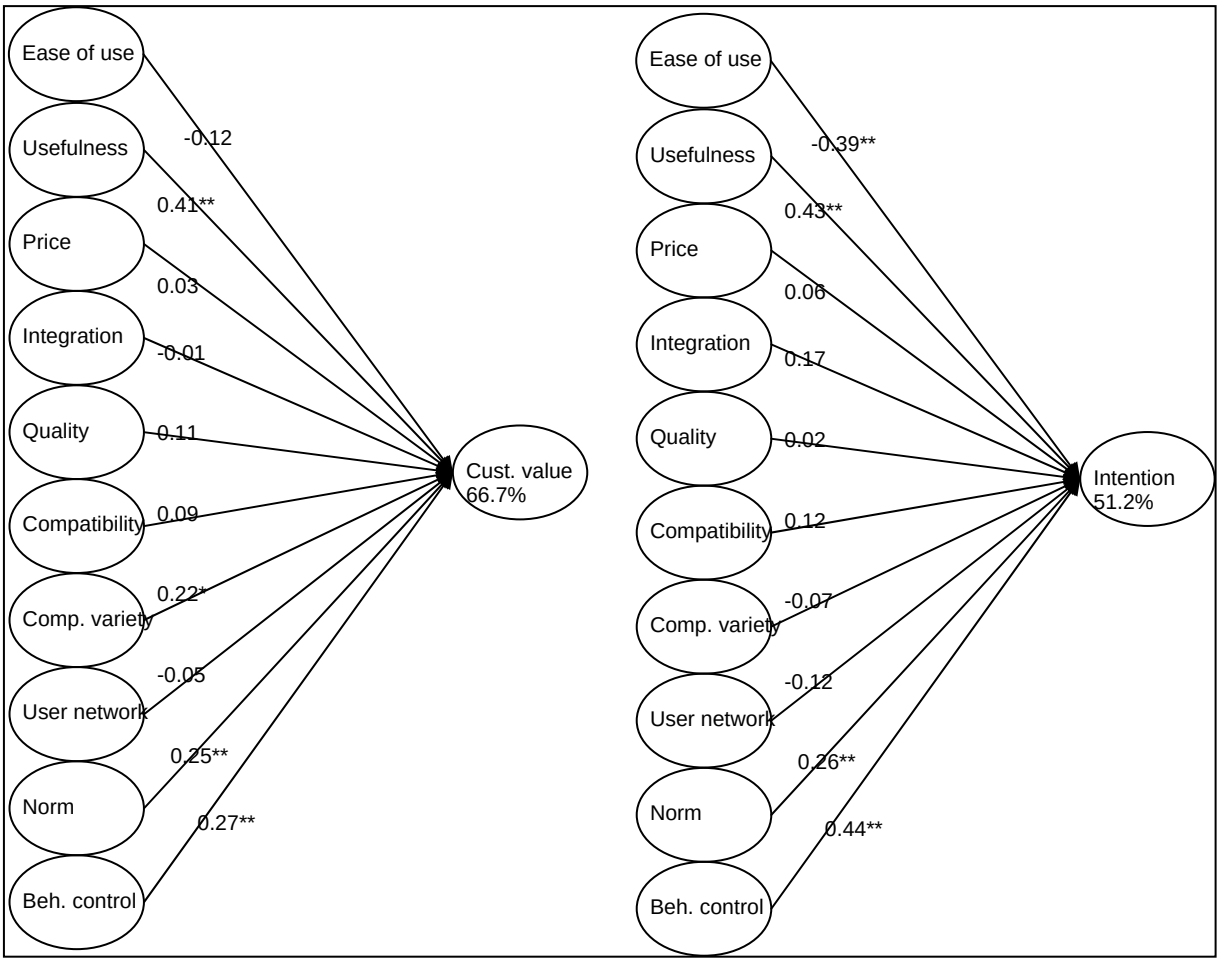


Figure 4.2 Path models – Mobile VoIP - customer value and intention to use.

We find that customer Value is influenced by Usefulness, Complements network variety, Norm and Behavioural control, whereas Intention is influenced by Ease of

use, Usefulness, Norm and Behavioural control. Thus, the difference between the two models is found in the influence of Complements network variety on Value and Ease of use negatively influencing Intention. Again, the negative influence of Ease of use requires further investigation, but it may indicate that Mobile services are not considered very difficult to use and that that users require some form of challenge once behavioural control is already considered in order to discharge usage intentions.

We next show the corresponding model for the Triple play services in figure 4.3.

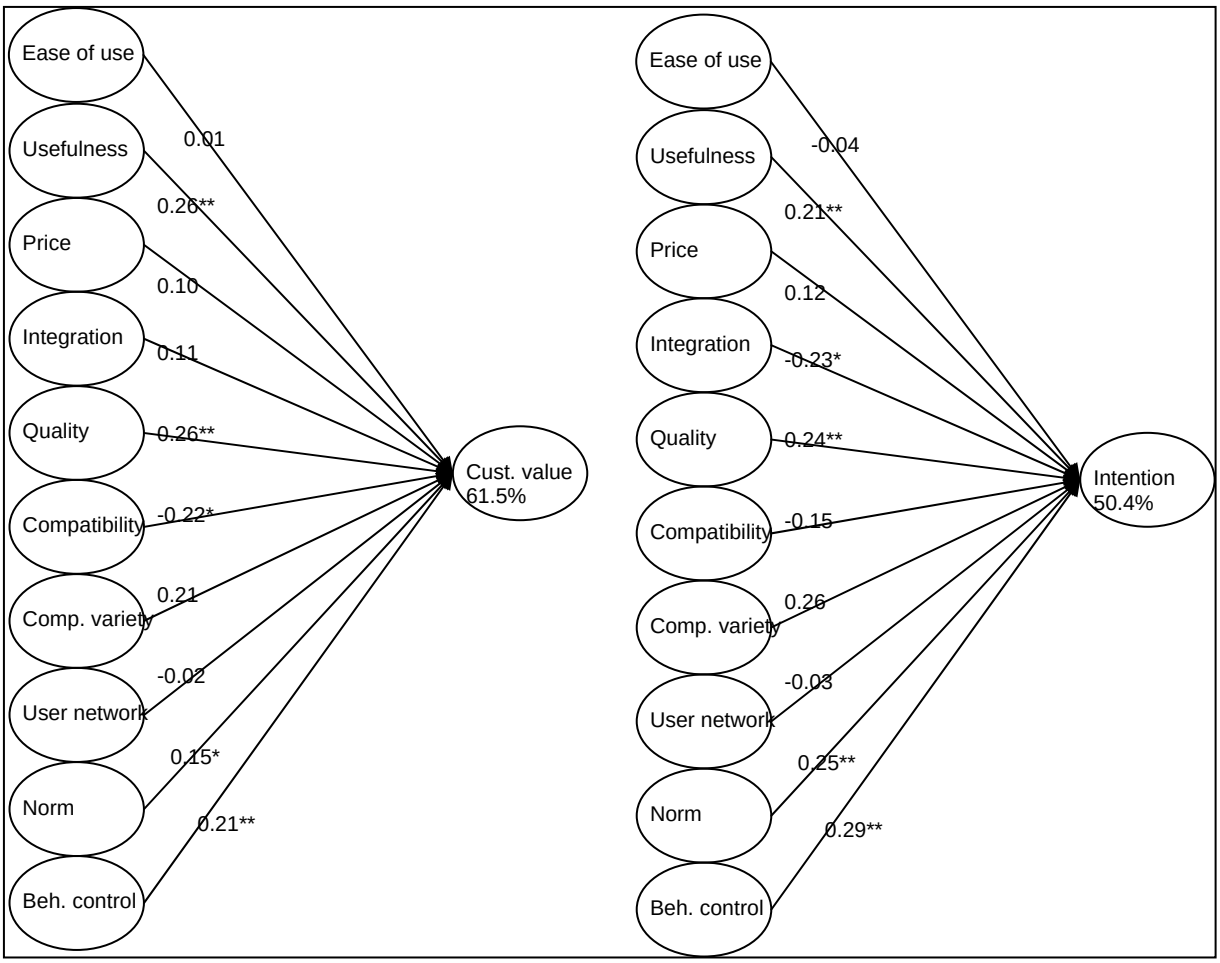


Figure 4.3 Path models – Triple play - customer value and intention to use.

The model fit was acceptable for both models. The Value-model showed a X^2 of 655.2 with 379 degrees of freedom giving a X^2 / d.f. of 1.73, an RMSEA of 0.054 and CFI of 0.95. The Intention model showed a X^2 of 644.1 with 350 degrees of freedom giving a X^2 / d.f. of 1.84, an RMSEA of 0.058 and CFI of 0.94. From figure 4.3 we find that the model explains 61.5% of the variance in Value and 50.4% of the variance in Intention. Thus, we again see that the separate model shows better fit and explains more of the variance in dependent variables.

Table 4.12 Stepwise regressions

	R^2	Variables included (t-values)
All - Value	0.56	Usefulness (8.51**), Norm (6.26**), Quality (5.91**), Behavioural control (4.71**), Complements variety (3.65**)
All - Intention	0.40	Norm (7.57**), Usefulness (5.43**), Behavioural control (5.38**), Quality (3.06**)
Mobile VoIP - Value	0.58	Usefulness (6.14**), Norm (5.62**), Quality (3.34**), Behavioural control (3.13**), Complements variety (2.90**)
Mobile VoIP - Intention	0.41	Norm (4.76**), Usefulness (5.79**), Behavioural control (5.39**), Ease of use (-3.34**), Price (2.13*)
Triple play - Value	0.55	Usefulness (4.95**), Quality (5.00**), Behavioural control (3.73**), Norm (3.53**), Integration (2.70**)
Triple play - Intention	0.46	Norm (5.41**), Quality (4.59**), Behavioural control (4.12**), Usefulness (3.06**)

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

We find that customer Value is influenced significantly by Usefulness, Quality, Compatibility, Norm and Behavioural control, whereas Intention is influenced by Usefulness, Integration, Quality, Norm and Behavioural control. As for the Mobile VoIP service, there are some problematic relationships due to negative influence of Compatibility on Value and Integration on Intention. This suggests the models should be reduced in complexity to increase parsimony.

To test some of the ways to reduce complexity, stepwise regressions may be used. However, this method is problematic with strongly correlated independent variables. Still, table 4.12 summarizes the results of applying stepwise regression to the six models shown above. The table shows only the final variables in the model, t-values and total variance explained.

We suggest using the stepwise regressions as a *guide* to reducing the complexity of the structural models shown in figures 4.1 to 4.3.

Starting with the full data set, the parsimonious models are shown in figure 4.4.

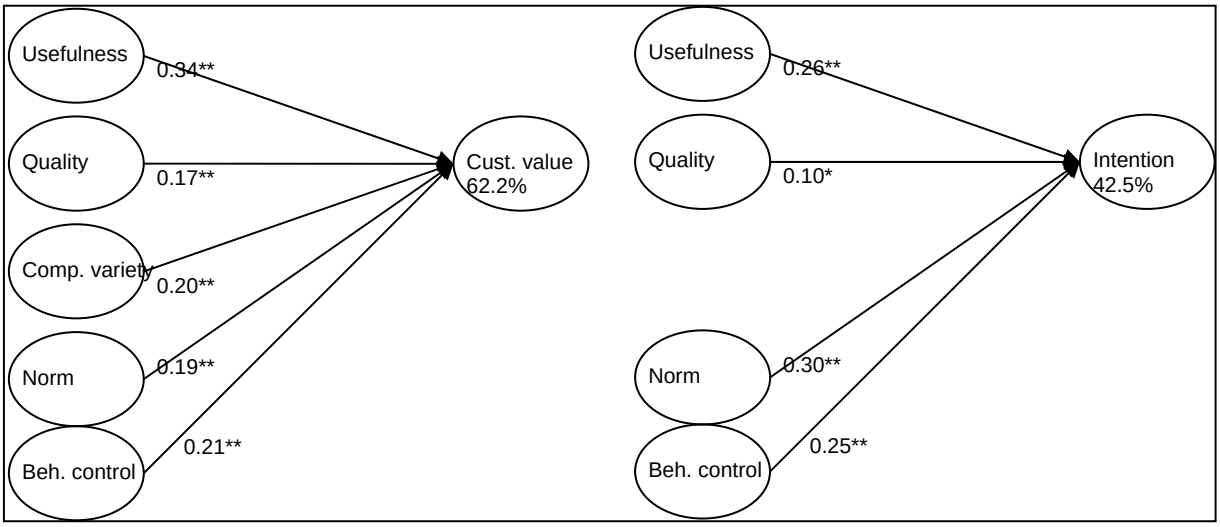


Figure 4.4 Parsimonious models – all data - customer value and intention to use.

The model fit was acceptable for both models. The Value-model showed a X^2 of 181.5 with 104 degrees of freedom giving a X^2 / d.f. of 1.75, an RMSEA of 0.039 and CFI of 0.99. The Intention model showed a X^2 of 125.9 with 67 degrees of freedom giving a X^2 / d.f. of 1.88, an RMSEA of 0.042 and CFI of 0.99. Thus, both parsimonious models showed better fit than the complex models. From figure 4.4

we find that the model explains 62.2% of the variance in Value and 42.5 % of the variance in Intention.

We also see that, as expected, the path coefficients are all significant indicating that a model including Usefulness, Quality, Norm and Behavioural control is a powerful model for explaining both Value and Intention, but that the network attribute reflecting Complements variety should be added when explaining Value. Still, results from the stepwise analysis suggested modifying the model to better fit the characteristics of each of the two services.

Turning to the Mobile VoIP model, the parsimonious models are shown in figure 4.5.

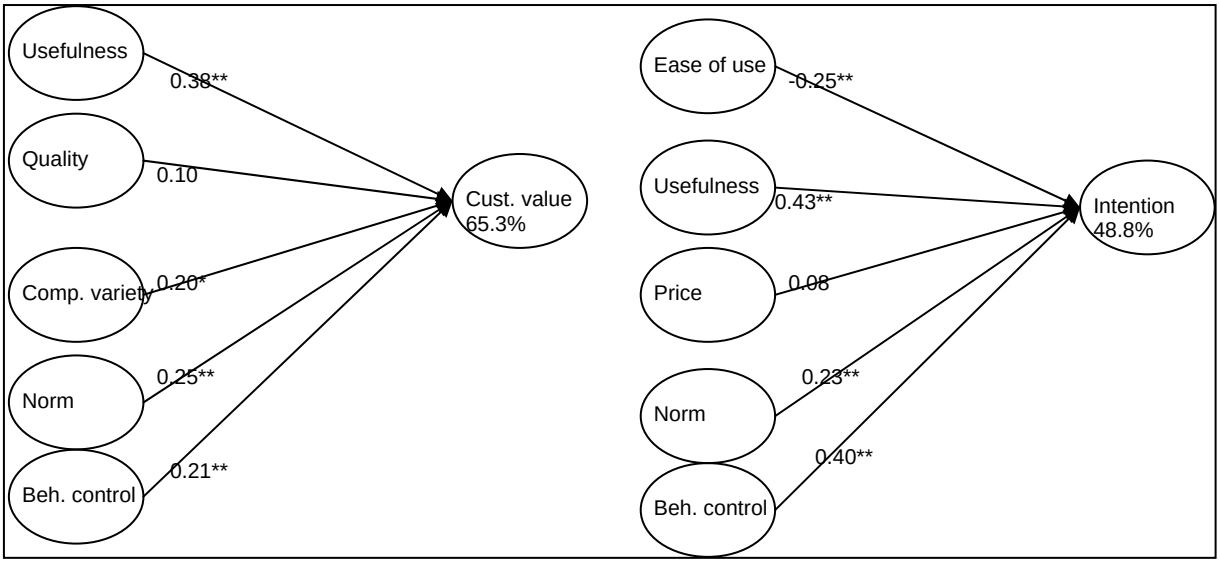


Figure 4.5 Parsimonious models – Mobile VoIP - customer value and intention to use.

The model fit was acceptable for both models. The Value-model showed a X^2 of 153.2 with 104 degrees of freedom giving a X^2 / d.f. of 1.47, an RMSEA of 0.044

and CFI of 0.98. The Intention model showed a X^2 of 161.2 with 104 degrees of freedom giving a X^2 / d.f. of 1.55, an RMSEA of 0.047 and CFI of 0.98. Thus, both parsimonious models showed better fit than the complex models. From figure 4.5 we find that the model explains 65.3% of the variance in Value and 48.8 % of the variance in Intention.

From figure 4.5 we see that all paths except the Price path are significant. Thus, when allowing correlation between the independent models of the parsimonious model, Price does not significantly influence Intention to use Mobile VoIP. In addition, we see that the negative relationship between Ease of use and Intention remains. From this we conclude that this relationship is not spurious, and either results from high intention to use Mobile services of more advanced users requiring challenge of the service rather than simplicity. It may also result from behavioural control capturing most of the user friendliness attributes of relevance to Mobile VoIP, leaving this variable to capture lack of challenge in the user experience.

Finally, the parsimonious models for the Triple play services are shown in figure 4.6.

The model fit was acceptable for both models. The Value-model showed a X^2 of 655.2 with 104 degrees of freedom giving a X^2 / d.f. of 1.73, an RMSEA of 0.054 and CFI of 0.95. The Intention model showed a X^2 of 96.8 with 67 degrees of freedom giving a X^2 / d.f. of 1.44, an RMSEA of 0.042 and CFI of 0.99. Thus, both parsimonious models showed better fit than the complex models. From figure 4.6 we find that the model explains 59.1% of the variance in Value and 46.8 % of the variance in Intention.

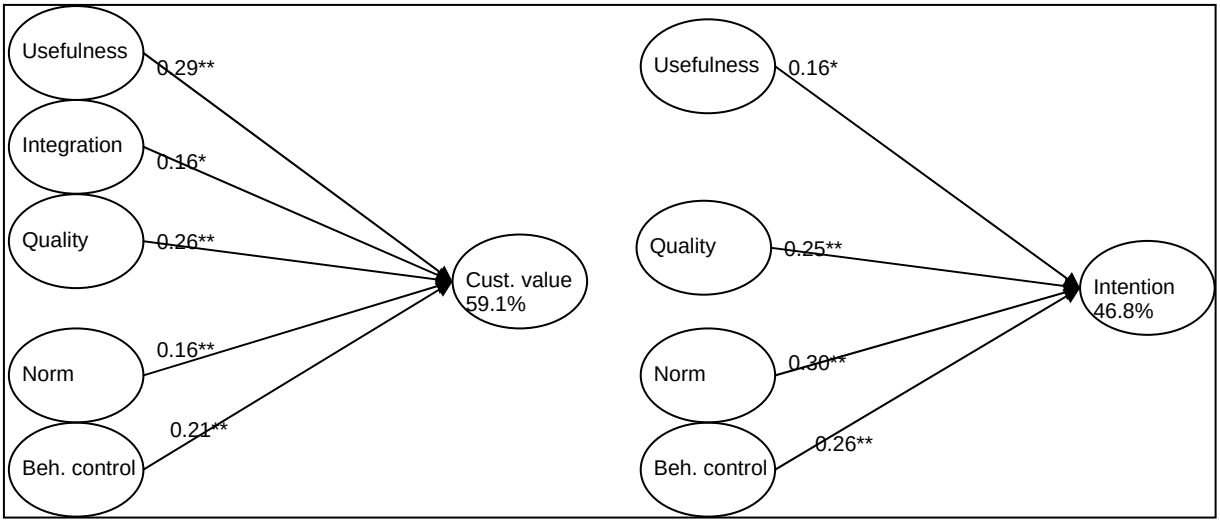


Figure 4.6 Parsimonious models – Triple play - customer value and intention to use.

We also see that, as expected, all path coefficients are significant and the problematic effect of Integration found in the complex model now is positive and straight forward. In addition, we conclude that service integration is of relevance to the perceived customer value of Triple play services, but that this does not seem to trigger customers' adoption.

In addition to the explanatory variables found significant, a relevant set of findings is also the variables found not to significantly influence Value and Intention, once the most explanatory variables are included. First, we see that Compatibility does not seem to influence Value and Intention for any of the services. This may be due to perceptions of a high level of user friendliness and compatibility for the two service areas in general as well as perceptions of being in control of the two services. Furthermore, we see that even though the stepwise regression suggested including Price in the Intention-model for Mobile VoIP, the variable did not influence Intention significantly. Thus, we found no effects of Price on Value and

Intention, neither in the complex models, nor in the parsimonious models. We also see that user network size is not influential for any of the two services. This makes us conclude that even though both services are offered as heterogeneous network services, simple, and "old fashioned" value drivers of usefulness, quality, norm and behavioural control are most important. In addition, some services have special characteristics that require attention to service specific drivers. For Triple play services, integration is of particular relevance, and for Mobile VoIP complements network variety is important to customer value.

4.2.4 Value proposition models

It can be argued that the models identified above include variables that are only to a limited degree affected by the value propositions of service providers. In particular, the variables Norm and Behavioural control are only very indirectly affected by value proposition designs. This is partly true because behavioural control is determined by skills and individual level attributes (e.g. resources), but providers may also facilitate the service, what is often included in the "facilitating conditions" dimension of behavioural control. Norms are affected by internal as well as external influence, and norms may be externally affected through the marketing strategy of service providers' business model as well as the marketing program supporting the value proposition. Still, these attributes are secondary when seen from the perspective of the value proposition. Thus, in this report, analysis were conducted without including Norm and Behavioural control to investigate how this affects explained variance and the significance of independent variables stemming directly from the value proposition of each heterogeneous network service. In figure 4.7, the Value and Intention models using all data are shown.

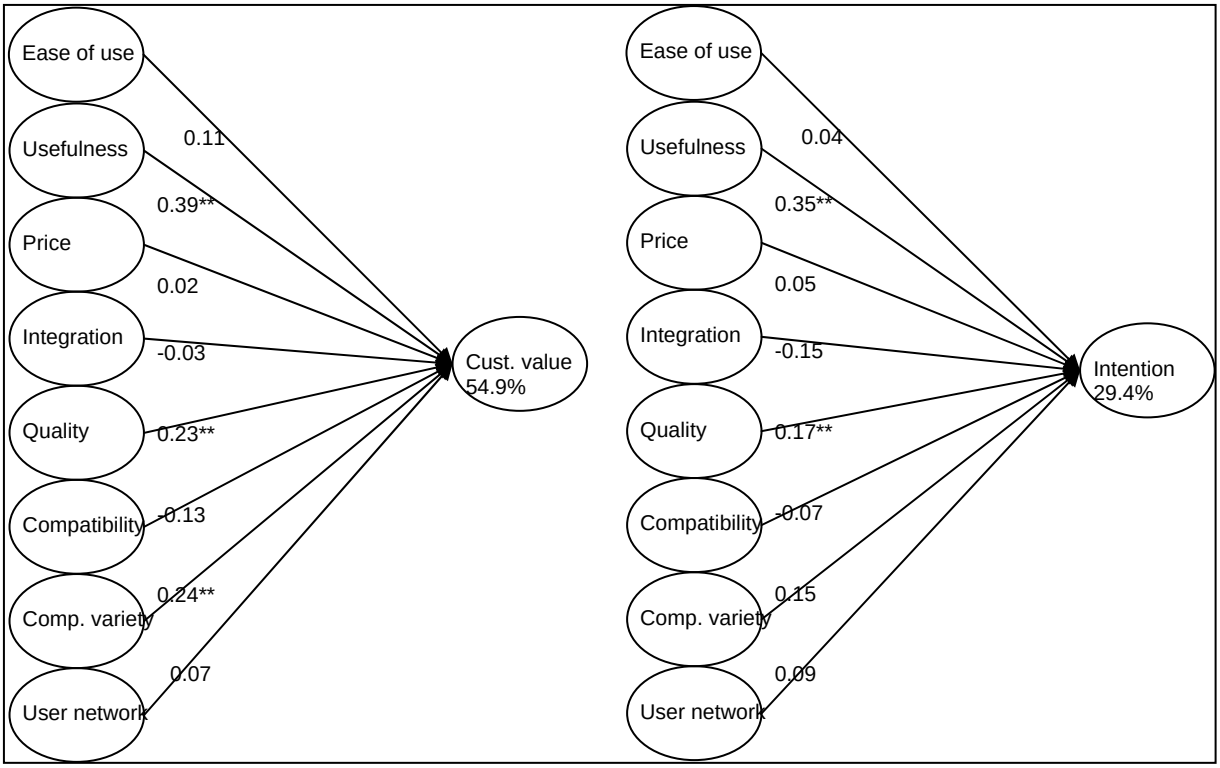


Figure 4.7 Value proposition models - all data - customer value and intention to use.

Figure 4.7 shows standardized regression coefficients, level of significance and explained variance of the two models. The model fit was acceptable for both models. The Value-model showed a X^2 of 533.2 with 263 degrees of freedom giving a X^2 / d.f. of 2.03, an RMSEA of 0.045 and CFI of 0.97. The Intention model showed a X^2 of 507.2 with 239 degrees of freedom giving a X^2 / d.f. of 2.12, an RMSEA of 0.048 and CFI of 0.96. From figure 4.7 we find that the model explains 54.9% of the variance in Value and 29.4% of the variance in Intention. From these results, we find that model fit is still acceptable and also is comparable to the fit of the full model shown above. However, we also see that while the drop in explained variance of Value is acceptable in the simpler value proposition model, the drop in the explained variance of Intention is considerable. We also see that the pattern of significant variables is the same as in the full model, when not

considering Norm and Behavioural control. Thus, value propositions of heterogeneous network services in general should be designed mainly to facilitate usefulness and service quality.

Looking at each of the individual services, the results for Mobile VoIP are shown in figure 4.8.

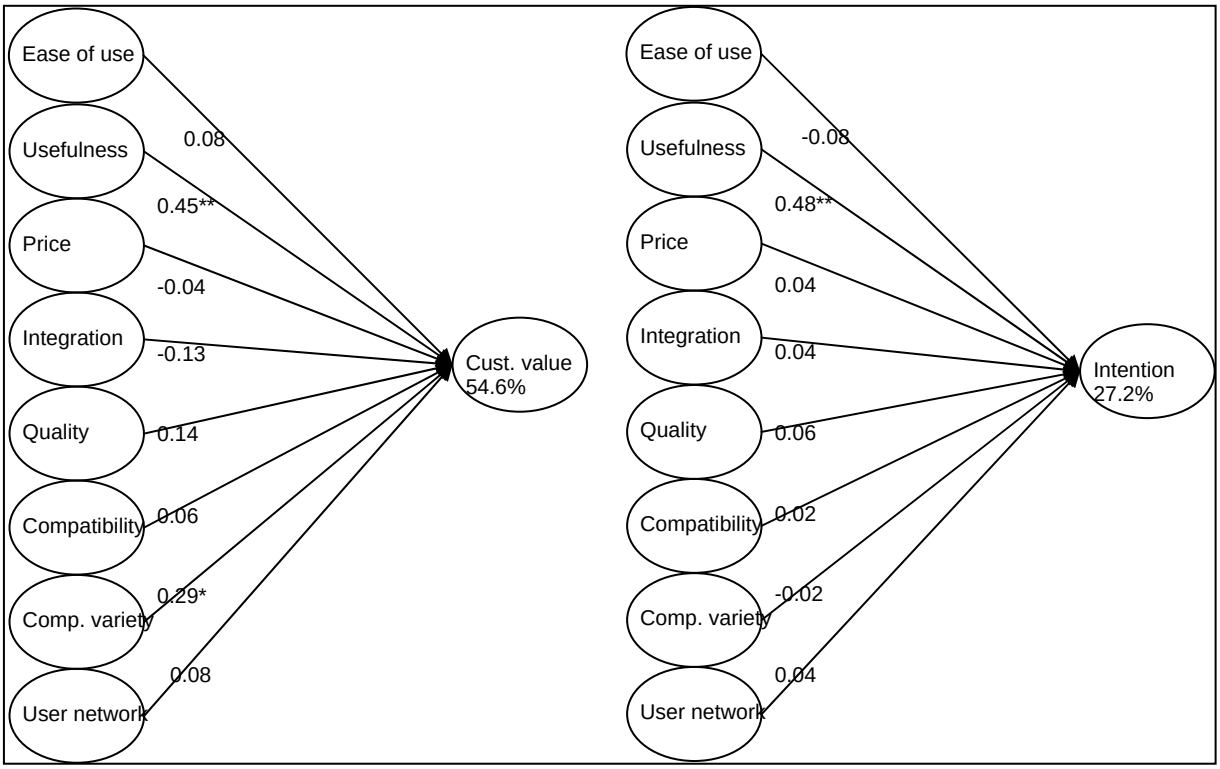


Figure 4.8 Value proposition models – Mobile VoIP - customer value and intention to use.

Figure 4.8 shows standardized regression coefficients, level of significance and explained variance of the two models. The model fit was acceptable for both models. The Value-model showed a X^2 of 416.9 with 263 degrees of freedom giving a X^2 / d.f. of 1.59, an RMSEA of 0.049 and CFI of 0.96. The Intention model showed a X^2 of 376.8 with 239 degrees of freedom giving a X^2 / d.f. of

1.58, an RMSEA of 0.049 and CFI of 0.96. From figure 4.8 we find that the model explains 54.6% of the variance in Value and 27.2% of the variance in Intention. From these results, we find that model fit is still acceptable and also is comparable to the fit of the full model shown above. Again, we also see that while the drop in explained variance of Value is acceptable in the simpler value proposition model, the drop in the explained variance of Intention is considerable. We also see that the pattern of significant variables is now very simple leaving Value explained by Usefulness and Complements variety and Intention explained by Usefulness only. We see that while the coefficient for Ease of use still is negative in the Intention model, it is no longer significant. This supports the explanation given above that Ease of use affects Intention negatively only when controlled for Behavioural control.

Finally, we present the corresponding models for the Triple play data in figure 4.9. Figure 4.9 shows standardized regression coefficients, level of significance and explained variance of the two models. The model fit was acceptable for both models. The Value-model showed a X^2 of 487.4 with 263 degrees of freedom giving a X^2 / d.f. of 1.85, an RMSEA of 0.058 and CFI of 0.95. The Intention model showed a X^2 of 490.2 with 239 degrees of freedom giving a X^2 / d.f. of 2.05, an RMSEA of 0.065 and CFI of 0.94. From figure 4.9 we find that the model explains 56.2% of the variance in Value and 38.7% of the variance in Intention. From these results, we find that model fit is still acceptable.

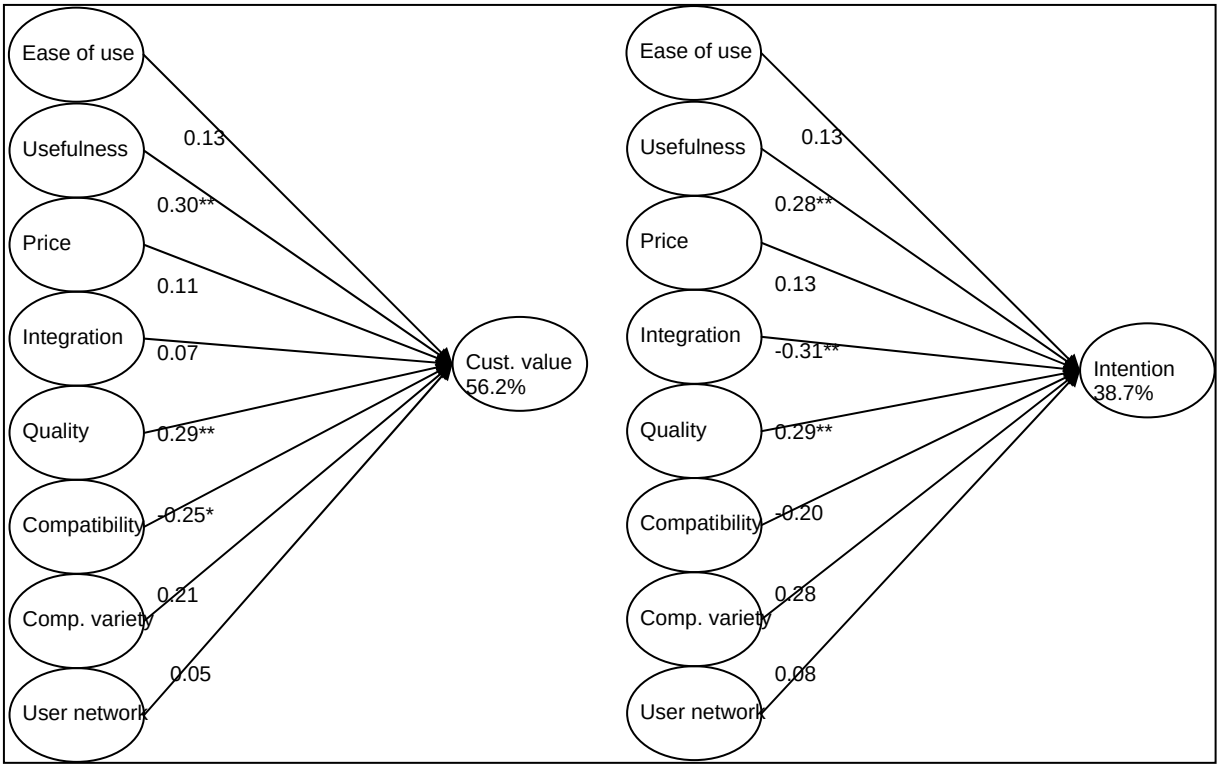


Figure 4.9 Value proposition models – Triple play - customer value and intention to use.

The fit of the Intention model is, however, not as good as in the complex model. We also see that while the drop in explained variance is largest for the Intention model, it is not as large as for Mobile VoIP. Again, we also see that the pattern of significant variables is the same as in the complex models. Thus, recommendations on how to design value propositions may be made based on the models including Norm and Behavioural control. The surprising effects of Compatibility on Value and Integration on Intention remains in the models, and suggests Triple play services are mainly valued for the Usefulness and Quality of the individual services provided through the Triple play package, not for creative combinations of individual services into compatible or strongly integrated new services.

4.2.5 Moderating effects

When analysing moderating effects, structural equations analysis is challenging and not well suited for exploratory analysis. Still, we have chosen to conduct traditional moderator analysis following the procedures of Jöreskog and Sörbom (1993) and Bollen (1989) and refined by Byrne (2004). This analysis is conducted as multigroup structural equation modeling using median split or any other two-group split of the moderator variable. To keep reporting simple, we mainly report findings that reflect important findings on the effects of moderating variables. Since we have already established that there are differences between Mobile VoIP and Triple play models, the analysis is conducted for these two services separately, starting with all moderated analyses for Mobile VoIP. We have also established that the models are robust to reductions in complexity excluding variables only indirectly affected by the value propositions of the service providers. Thus, all analyses of moderation are conducted applying the parsimonious models for each of the two services. Also, model fit is only discussed separately if there is any doubt that the fit is clearly acceptable.

Starting with the simple, categorical variables, the moderating effect of Gender is illustrated using the parsimonious models in table 4.13.

Table 4.13 reports the results of the multigroup analysis. In the first quantitative column, the X^2 value of the difference between the free and constrained model keeping the relevant path coefficient equal between the groups is reported. Next, the relevant standardized path coefficients are reported for each group and model. Care should be taken in the interpretation of this type of multigroup analysis because the effect of the moderator variable is investigated for only one of the

independent variable at the time. Still, the procedure is believed to be one of the most robust and widely published.

Table 4.13 Mobile VoIP - moderating effects of Gender

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. M	Path coeff. F
Value	Usefulness	1.44	0.50**	0.28**
	Quality	0.14	0.03	0.08
	Comp. variety	1.20	0.12	0.24
	Norm	2.03	0.18*	0.35**
	Beh. control	2.50	0.31**	0.11
Intention	Ease of use	4.05*	-0,11	-0.41**
	Usefulness	1.93	0.32**	0.51**
	Price	14.21**	-0,13	0.33**
	Norm	0.83	0.32**	0.18
	Beh. control	0.25	0.47**	0.42**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.13 we see that the relationships between the independent variables and Value are not significantly moderated by gender. For example, the difference in coefficients for behavioural control that we observe in table 4.13 between male and female users is not sufficiently great to be significant, despite being considerable when investigating coefficients only. On the other hand we see that Intention to use Mobile VoIP is clearly moderated by Gender. The effect of Price is greater among female than male consumers, and the effect of Ease of use is greater among female than male consumers. The negative sign of the Ease of use effect, on the other hand is difficult to interpret. The considerable difference we observe in the coefficients for Norm on the other hand is not significant.

The next potential moderating variable is Age. Age was analyzed splitting the samples in approximately half sized sub-samples using a median split. The moderating effect of Age is illustrated using the parsimonious models in table 4.14.

Table 4.14 Mobile VoIP - moderating effects of Age

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Y	Path coeff. O
Value	Usefulness	0.83	0.43**	0.32**
	Quality	1.02	0.20*	0.06
	Comp. variety	0.15	0.22	0.15
	Norm	2.19	0.19*	0.34**
	Beh. control	0.02	0.22**	0.20**
Intention	Ease of use	0.63	-0.14	-0.31**
	Usefulness	0.00	0.39**	0.48**
	Price	0.90	0.14	0.02
	Norm	0.05	0.22*	0.19*
	Beh. control	0.61	0.32**	0.51**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

Again we see that the effects in the Value model are not moderated, this time by Age. Despite great differences in the coefficients for Quality and Usefulness, the great variance within each age category makes the differences between models not significant. Turning to the Intention model, we also find no moderating effects. This is again despite the relatively great difference in coefficients for both Ease of use and Price. Still, we have to conclude that there are no moderating effects of Age.

Experience was analyzed splitting the samples in approximately half sized sub-samples using a median split. The moderating effect of Experience is illustrated using the parsimonious models in table 4.15.

Table 4.15 Mobile VoIP - moderating effects of Experience

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Inex.	Path coeff. Ex.
Value	Usefulness	0.05	0.42**	0.39**
	Quality	1.62	0.03	0.19*
	Comp. variety	0.05	0.18	0.22
	Norm	0.92	0.31**	0.20*
	Beh. control	3.16	0.09	0.29**
Intention	Ease of use	4.75*	-0.40**	-0.06
	Usefulness	0.01	0.45**	0.42
	Price	0.09	0.09	0.12
	Norm	1.28	0.31**	0.16
	Beh. control	0.32	0.38**	0.26

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.15 we see that Value is not moderated by Experience. There are great differences in the path coefficients for both Quality and Behavioural control, but none of the differences are significant at the 5% level. Behavioural control is significant at the 10% level, but in this report we require moderated effects to be significant at the 5% level. The effects on Intention are moderated by Experience, but only for Ease of use. The direction is counterintuitive if the effect is interpreted as differences in the importance of challenge. Thus, there are unexplained issues in the direction of the effects of Ease of use on Intention that require further analysis.

Finally, the analysis of adoption Mode showed two distinctly different modes. However, the modes were not completely independent. Thus, each of the Mode moderations is analyzed separately, starting with Complementary Mode. The moderating effect of Complementary Mode is illustrated using the parsimonious models in table 4.16.

Table 4.16 Mobile VoIP - moderating effects of Complementary Mode

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Non.	Path c. Comp.
Value	Usefulness	0.96	0.68**	0.32**
	Quality	4.91*	-0.13	0.17**
	Comp. variety	0.02	0.22	0.15
	Norm	1.25	0.14	0.30**
	Beh. control	0.00	0.08	0.20**
Intention	Ease of use	1.65	-0.52**	-0.19*
	Usefulness	5.49*	0.99**	0.29**
	Price	0.32	-0.00	0.09
	Norm	10.13**	-0.14	0.37**
	Beh. control	6.37*	0.61**	0.33**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

We find that Value is moderated by Complementary mode. There are great differences in path coefficients, but due to error variance, only the difference for Quality is significant. Only users in Complementary mode are influenced by Quality. For Intention, we find that it is strongly moderated by Complementary mode. Of the identified differences, the difference for Usefulness, Norm and Behavioural control are significant. Thus, consumers in Complementary mode are less influenced by Usefulness, more influenced by Norm, and less influenced by Behavioural control than those that are not in Complementary mode. Explained variance of the models for each sub-sample also varies. This is partly due to unequal sample sizes in the median split of the categorical Complementary mode variable.

When comparing the direction of the differences with the results from the substitution mode, we find that they are in the expected direction. Thus, Substitution mode and Complementary modes are negatively correlated, but not perfectly so when it comes to describing the mode of adoption that consumers are in when they consider the value and intention to use heterogeneous network services.

Using median split multigroup analysis, the results of the moderating variable Substitution Mode are shown in table 4.17.

Table 4.17 Mobile VoIP - moderating effects of Substitution Mode

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Non	Path coeff. Subs.
Value	Usefulness	0.00	0.26*	0.36**
	Quality	1.57	0.16*	-0.00
	Comp. variety	0.00	0.18	0.29
	Norm	6.55**	0.36**	0.15
	Beh. control	0.12	0.21**	0.27*
Intention	Ease of use	3.18	-0.34**	-0.12
	Usefulness	4.59*	0.43**	0.18
	Price	1.26	0.14	0.02
	Norm	0.73	0.28**	0.28*
	Beh. control	2.50	0.49**	0.30*

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.17 we see that Value is moderated by Substitution mode. We find great differences in path coefficients for Quality and Norm, but of these only Norm is significant at the 1% level. Thus, we conclude that Value is more influenced by Norm for consumers not in Substitution mode than for consumers in this mode. Intention is also moderated by Substitution mode. We see that there are great differences in the coefficients of Ease of use and Usefulness, but only Usefulness is significant at the 5% level. From the direction of the differences we see that those in Substitution mode are less influenced by Usefulness. From the difference in explained variance we found that it seems to be more difficult to explain the Intention of those in Substitution mode. This suggests the parsimonious model should be extended to investigate those in Substitution mode further. Generally, we conclude that mode of adoption is important in understanding the effects of service attributes as well as contextual influences (norm and behavioural control) on the

perceived customer value and intention to use heterogeneous network services, in this case Mobile VoIP.

We next turn to the Triple play service, and report corresponding moderator analyses for this service. Starting with the simple, categorical variables, the moderating effect of Gender is illustrated using the parsimonious models in table 4.18.

Table 4.18 Triple play - moderating effects of Gender

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. M	Path coeff. F
Value	Usefulness	3.18	0.40**	0.19
	Quality	0.75	0.21**	0.34**
	Integration	0.00	0.14	0.14
	Norm	0.09	0.14*	0.12
	Beh. control	0.06	0.19**	0.21*
Intention	Usefulness	0.00	0.14	0.15
	Quality	1.77	0.19*	0.34**
	Norm	4.91*	0.43**	0.13
	Beh. control	0.00	0.25**	0.31**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.18 we see that the relationship between Usefulness and Value is not moderated by gender. There is a considerable difference in coefficients for Male and Female consumers for Usefulness (in the expected direction), but the difference is only significant at the 8% level. We also see that the effect on Intention is moderated by Gender for Norm, suggesting that Male subjects are more driven by Norm than Female subjects when it comes to the Intention to adopt Triple play services.

The next potential moderating variable is Age. Age was analyzed splitting the samples in approximately half sized sub-samples using a median split. The moderating effect of Age is illustrated using the parsimonious models in table 4.19.

Table 4.19 Triple play - moderating effects of Age

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Y	Path coeff. O
Value	Usefulness	0.06	0.28*	0.30**
	Quality	4.48*	0.40**	0.12
	Integration	0.37	0.10	0.20*
	Norm	0.11	0.17*	0.13
	Beh. control	4.66*	0.08	0.32**
Intention	Usefulness	0.03	0.20	0.21**
	Quality	0.30	0.25*	0.15
	Norm	4.14*	0.43**	0.16*
	Beh. control	7.60**	0.11	0.42**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

We find that there are considerable differences in path coefficients for some of the variables. For Value we find that the effects of Quality and Behavioural control are moderated by Age. Thus, Younger consumers are more influenced by Quality than Older, and Older consumers are more influenced by Behavioural control than Younger. For Intention we find that the effect of Behavioural control on Intention is strongly moderated by Age. The direction is in the expected direction in that it is the older consumers that are particularly influenced by Behavioural control. This is partly due to the higher perceived Behavioural control of Young subjects (Mean 2.98 versus 2.73; $F=4.97$; d.f.=248; $p<0.05$). In addition, the effect of Norm on Intention is also moderated by Age. Younger subjects are more influenced by Norm than Older subjects. These findings were complemented by a complete analysis of moderation for the complex models presented above. These analyses revealed a significant moderation of Age on the relationship between Price and Intention (X^2 diff=9.38, $p<0.01$) and Compatibility and Intention (X^2 diff=8.34, $p<0.01$). The

directions are as expected showing that Young subjects are more sensitive to Price than Old subjects and that Young subjects are less influenced by Compatibility than Old subjects. All in all this suggests that the Intention to adopt Triple play services is strongly moderated by Age. Thus, segmentation of triple play services may be conducted based on age.

Experience was analyzed splitting the samples in approximately half sized sub-samples using a median split of the three item Experience scale. The moderating effect of Experience is illustrated using the parsimonious models in table 4.20.

Table 4.20 Triple play - moderating effects of Experience

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Ine.	Path coeff. Exp.
Value	Usefulness	0.01	0.32*	0.27**
	Quality	0.99	0.18*	0.36**
	Integration	0.00	0.17	0.13
	Norm	2.23	0.07	0.23**
	Beh. control	0.19	0.24**	0.22**
Intention	Usefulness	0.06	0.19*	0.10
	Quality	1.81	0.15	0.33**
	Norm	1.93	0.24**	0.35**
	Beh. control	0.25	0.34**	0.21**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.20 we see that Value and Intention are not moderated by Experience. There are considerable differences in path coefficients, but due to large error variance, these are not significant. This called for a complete moderation analysis of the complex model as well. This showed that there was a moderated effect of Compatibility on Intention (X^2 diff=4.08, $p<0.05$). Still, the Intention to use Triple play services is not strongly moderated by Experience.

The moderating effect of Complementary Mode is illustrated using the parsimonious models in table 4.21.

Table 4.21 Triple play - moderating effects of Complementary Mode

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Non.	Path c. Comp.
Value	Usefulness	4.93*	0.44**	0.15
	Quality	0.00	0.27**	0.29**
	Integration	0.57	0.09	0.24*
	Norm	0.70	0.08	0.20**
	Beh. control	0.98	0.13	0.26**
Intention	Usefulness	1.83	0.28*	0.13
	Quality	0.03	0.25*	0.24*
	Norm	6.90**	0.06	0.47**
	Beh. control	0.17	0.26**	0.25**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

We find that the relationship between Usefulness and Value is moderated by Complementary mode. Consumers in Complementary mode are less influenced by Usefulness than consumers not in this mode. Intention is also strongly moderated by Complementary mode because subjects in Complementary mode are more influenced by Norm than those not in this mode. Thus, Complementary mode reflects users not focusing Usefulness but instead by other intrinsic attributes of the service.

Using median split multigroup analysis, the results of the moderating variable Substitution Mode are shown in table 4.22.

Table 4.22 Triple play - moderating effects of Substitution Mode

Dependent	Independent	X^2 diff., d.f.=1	Path coeff. Non.	Path c. Subs.
Value	Usefulness	0.77	0.16	0.27*
	Quality	1.19	0.32**	0.23*
	Integration	0.05	0.14	0.12
	Norm	0.06	0.20*	0.18*
	Beh. control	0.01	0.23**	0.20*
Intention	Usefulness	0.01	0.13	0.09
	Quality	1.11	0.28**	0.15
	Norm	0.00	0.37**	0.25**
	Beh. control	2.23	0.18*	0.35**

* Indicate significance at $p<0.05$ and ** at $p<0.01$.

From table 4.22 we see that Value and Intention are not moderated by Substitution mode.

We found few results indicating that the Value and Intention to use Triple play services are moderated by mode of adoption. Only two effects of Mode on Intention were found significant, and both were for Complementary mode. Large differences in explained variances in moderated models were identified. This suggests that the complex models should be tested for Mode moderation. When doing so for Triple play we found that only the relationship between Compatibility and Intention was moderated and only for Substitution mode (X^2 diff=6.90, $p<0.01$). Despite the difficulties in interpreting the direction of the effects of Compatibility and Integration in the complex model, this moderation was more explainable. It showed that while those in Substitution mode were weakly effected positively by Compatibility, those not in Substitution mode where affected negatively by Compatibility. Thus, those in Substitution mode want something compatible replacing what they have whereas those not in Substitution mode want something different from and not necessarily compatible with, what they are currently being offered.

4.2.5 Comparing the results with homogeneous network services results

We have previously conducted two large scale studies of homogeneous network services. Parts of the results are published in Nysveen, Pedersen and Thorbjørnsen (2005), and in Thorbjørnsen, Pedersen and Nysveen (2008). The first of these studies focused intentions only, whereas the second applied a perspective corresponding to the one applied in this report, and focused both customer value and intentions. Furthermore, the first study focused on perceived service attributes only, whereas the second study included both service and network attributes. Due to the lack of significant findings in the current study for network attributes, results seem comparable across all three studies.

A first comparison may be to compare the levels of Value and Intentions across all services. Table 4.23 shows mean values for the dependent variables measured in each study.

Table 4.23 Mean values of 14 studies conducted over the last five years

Service	Value	Intention
SMS-communication		3.5
MMS-communication (2005)		3.1
Chat (2005)		1.3
Gaming (2005)		2.6
Payment (2005)		2.5
Parking		3.0
MMS-communication (2008)	2.2	
Chat (2008)	3.3	
MMS-content	3.7	
Payment (2008)	3.5	
Gaming (2008)	3.4	
Charging	4.1	
Mobile VoIP (V)	2.6	2.4
Triple play (V)	2.8	2.4

Looking at the means of table 4.23, the general levels of Intention and Value in the current study seem low. Thus, one could conclude that neither the Value, nor the Intention to use Mobile VoIP and Triple play services are particularly high. However, we also see that the mean values of Value and Intention of previous studies vary considerably. Still, the Intention to use the current services are only higher than the Intention to use chat services in the 2005-study, and Value levels are only slightly higher than the Value of MMS-communication services in the 2008-study. This leads us to conclude that despite sample differences, the Value and Intention to use Mobile VoIP and Triple play services are not very high.

Turning to significant relationships in the models applied in the three studies, the first study showed the pattern of significant explanatory variables across six different services presented in table 4.24.

Table 4.24 Pattern of significant variables in the 2005-study

Service/ Attribute	SMS-comm.	MMS-comm.	Chat	Gaming	Payment	Parking
Expressive-ness	*	*	*	*	*	*
Enjoyment	*	*	*	*	*	
Usefulness	*			*		*
Attitude	*		*			
Norm		*	*			
Beh. control	*	*		*	*	

* indicate significant variable

From table 4.24 we see that Expressiveness and Enjoyment were the most significant variables across all services. We also see that Behavioural control and Usefulness were found important. The other variables included in the current study

were not reported explicitly in these studies. For example, Ease of use was found of little importance to well-established mobile services and thus was not investigated explicitly in these studies.

Turning to the study of customer value including network attributes conducted in 2005 and published in 2008, we find the pattern of significant variables in table 4.25.

Table 4.25 Pattern of significant variables in the 2008-study

Service/ Attribute	MMS-comm.	Chat	MMS-content	Payment	Gaming	Charging
Ease of use						
Usefulness	*	*		*		*
Compatibility		*	*	*		
Service quality		*				
Innovativeness	*		*		*	*
Network size	*	*	*			
Complements variety	*	*			*	
Speed of dev.						*
Complements quality			*	*	*	
Beh. control	*		*	*	*	*

* indicate significant variable

From this study we find that the most influential variables were Behavioural control, Usefulness and Innovativeness. We see that as expected Ease of use was of no relevance, and that service Quality was of little importance. We, however, found

some indications that network attributes were relevant, in particular User network size and the complements network attributes Variety and Quality.

Turning to the current study, we summarize the findings for the two investigated services in table 4.26, using the complex models.

Table 4.26 Pattern of significant variables in the current study

Service / Attribute	Mobile VoIP (V)	Triple play (V)	Mobile VoIP (I)	Triple play (I)
Ease of use			* (neg)	
Usefulness	*	*	*	*
Price				
Compatibility				
Complement variety	*			
Quality		*		*
Integration				*(neg)
User Network				
Norm	*	*	*	*
Behavioural control	*	*	*	*

* indicate significant variable (V-Value model, I- Intention model)

For the current services in table 4.26 we see that there are differences in Value models and Intention models. There are also similarities. The more detailed analyses above suggest that there are significant differences. Comparing the results to the homogeneous network services reveals few systematic differences.

Usefulness, Behavioural control and Norm are important variables. Of these only Norm has not been found so consistently important in previous studies. In previous studies, Norm has been shown to be most influential in a time window when the

service is radically new. Both Mobile VoIP and Triple play services are new to the subjects investigated in this study, so this rather than heterogeneous network characteristics is likely to explain the difference in findings. Looking at network attributes, we found little that suggested these were more relevant to the current services than to the previously studied homogeneous network services. Also Compatibility and Integration, believed to be of particular importance to heterogeneous network services, proved to be of minor importance. Moderator analysis revealed, however, that the effects of these two attributes are moderated by Age and Experience, so there are segment differences in the importance of these attributes. Still, Compatibility proved to be significant to Value in three of the studies conducted on homogeneous network services in 2005, so the relevance of this attribute seem rather unrelated to characteristics of the network providing the service (heterogeneity).

The negative influences of Ease of use and Integration in the Intention models of Mobile VoIP and Triple play proved hard to explain. For Ease of use it could be explained by challenge, a similar finding we made of a previous study of gaming services and for Integration it could be explained as directly reflecting negative experiences of integrated services or a lack of understanding in what types of integration is possible for heterogeneous network services. In any case, care should be taken to base value propositions for heterogeneous network services on strong forms of integration without careful segmentation of customers and explicit value assessments.

This leads us to conclude that the two heterogeneous network services investigated here differ systematically from each other when considering both consumers value assessments and their reflections on whether to adopt the services or not. On the

other hand, these assessments do not differ systematically from the assessments made by consumers of homogeneous network services. Thus, service providers are left with designing their value propositions with careful considerations for simple issues such as usefulness, and for designing their marketing strategies to carefully consider differences between segments in how they are influenced by norms and how their skills and experience vary (behavioural control). That said, lack of findings also provides interesting results. For example, Price did not seem to be a very important driver of neither Value nor Intentions. Care should still be taken to design revenue models to serving particular segments differently because the effect of Price varied considerably between different customer segments.

5 CONCLUSIONS, DISCUSSION AND IMPLICATIONS

In the research reported here we have applied a SCP-framework for investigating two service areas representing heterogeneous network services. The SCP-framework proposes that business model design is made under structural constraints and to optimize customer value and service adoption. The reason why customer value and service adoption is focused rather than traditional performance measures like profitability is that the services are new and innovative services where critical mass (adoption) is more important in the short run and customer value is more important in the not-too-long run. Customer value is particularly important due to high churn rates in many of these service markets. Among the structural constraints of business model design, the research framework focused market related, technology related and regulatory constraints. Again, this is a consequence of adapting the more general SCP-framework applied in previous studies (e.g. Methlie and Pedersen, 2007) to heterogeneous network services.

The two service areas analyzed in this report is Mobile VoIP and Triple play services. Among the reasons why these services were focused are that they originate and extend from traditional homogenous network services and are currently being commercialized. A more thorough argumentation for selecting these service areas is given in Pedersen et al. (2007).

The report presents the results from the study of business model design and the study of consumer behaviour separately. The business model design study was conducted as a qualitative interview study of 12 management or expert level informants in each of the two service area (7 from the Triple play area and 5 from the Mobile VoIP service area). Interviews were approximately 1 hour long and

were transcribed and analyzed applying traditional principles of content analysis. The consumer behaviour study was conducted as a quantitative, quasi-experimental study of the effects of variations in business model design on customer value and service adoption. Subjects were randomly sampled to represent Norwegian consumers of age 15+. All together, 498 responses were collected (253 from the Triple play area and 245 from the Mobile VoIP service area) and analyzed.

From the business model design study we may conclude that for Mobile VoIP, the main value proposition is reduced or better controlled end-user costs. The main market segment is business users due to both complexity and acquisition costs. The governance form for the service requires cooperation, but has not become as open as was originally expected. The revenue model of most providers is free intra-provider calls and revenue is, or could be, generated through termination arrangements and out of IP-network calls.

Most subjects find regulation to stimulate Mobile VoIP innovation, but complain that incumbent mobile providers, despite regulatory policy, may still exercise market power. Regulatory policy is also found relatively predictable. The market of Mobile VoIP providers is perceived as fragmented as a contrast to the perception of operator and handset manufacturer markets which are perceived as dominated by large and powerful enterprises. Despite developed standards for Mobile VoIP, the technology is perceived as lacking in practical de facto standardization. Still, SIP is unanimously believed to be the surviving standard.

Providers expect the proposition of reduced costs to be valued by customers, but also stress the importance of ease of use, something that currently contrasts the complexity of the value proposition. Providers see user network size as a potential

barrier to value because end users will expect interoperability as for current mobile services. Some, but not all providers mention the importance of complements network services with Mobile VoIP as just a "hygiene factor". All, however, expect complements network services only to provide short term competitive advantage because they are easy to copy.

As expected, two contrasting value propositions are mentioned for Tripe play, one perceiving it as a bundle only, and one perceiving it as an integrated offering. Of these, the integrated proposition is perceived as the one "*creating real value to customers*". Still, the practically communicated proposition is the bundling proposition, with an additional focus on the speed of the Internet access and/or the openness of the network. Underlying technology is seen as important in the value proposition with capacity as a limiting factor for integrated offerings for some of the providers. The difference between a bundled offering and an "open network" offering is also mentioned. Regional strength is seen as an important part of market strategy and other segmentation is used mainly for marketing communication purposes. Fibre providers address high income segments when defining regional launching areas. Vertical governance forms are used, particularly by larger providers. Only among fibre providers do we find mature horizontal governance forms. Revenue models are traditional in the Internet access and VoIP parts of the offering (fixed price, increasing capacity over time), but the TV-part is currently in a phase of transition when it comes to innovating new revenue models. This is particularly relevant in the upstream part of the value chain.

Current regulation limits the bundling of SMP providers, something that they see as a limiting factor in business model innovation. The other regulatory issue that is mentioned is if LLUB will be enforced for cable and fibre providers, but it is

expected that to stimulate competition, regulatory authorities will wait before such instruments are used. The market consists of Telenor as a large incumbent provider characterized as the least innovative in business model innovation and smaller and more fragmented challengers. There is currently considerable general public attention on Telenor's position, particularly in the TV-area. Technology is seen as a limiting factor in offering Triple play due to capacity limitations in copper based distribution forms. Despite these limitations few examples can be found of offering Triple play through an integration of homogenous network services into a truly heterogeneous network services offering.

As for Mobile VoIP, price is suggested as an important service attribute also for Triple play. It is surprising to see that integration is stressed in the value proposition discussion but not mentioned when asking informants of their perceptions of valuable end-user service attributes. Instead, "homogeneous network services attributes" like quality and ease of use is mentioned. Due to a more information oriented focus of the Triple play service offering, user network attributes is not focused much. Complements network attributes are mentioned but few examples are given of how it may be utilized to increase end-user value. Instead, one may consider the "open network" offering by some fibre providers as founded on the idea that end-users value freedom of choice among "services perceived as homogeneous network services" to complements network services integration.

When comparing the two service areas Mobile VoIP and Triple play on the business model dimensions, there are relatively few similarities. The cost value proposition, the combination of dominant incumbent providers versus challengers, the lack of matured horizontal governance forms and the perceptions of structural

conditions are relatively similar. Both services, however, are currently offered applying business models known from homogenous network services. For Mobile VoIP, standardization and lack of horizontal forms of collaboration are limiting factors, but it is not obvious that these factors are the limiting factors in business model innovation. For Triple play services, the "open network" business model must be considered a business model innovation that, even though it is not radical, at least it is not only transferred from known homogeneous network services. In none of the service areas do we find any providers applying or testing radical business model innovations corresponding to those found in, for example, Internet content services or Airport development.

From the consumer behaviour study we may conclude that value proposition design that affects end-users service attribute perceptions is difficult. Price propositions are easily perceived, but other propositions are difficult to communicate. Furthermore, value proposition manipulations that result in different service attribute perceptions have little influence on final end-user value or intention to adopt the service. Instead, there are strong inherent attitudes towards services like Mobile VoIP, and adoption and end-user value is more driven by non-value proposition related variables, such as norm and behavioural control. Among the value proposition derived drivers of influence to adoption are usefulness and ease of use and drivers of end-user value include usefulness and complements network variety. Thus, usefulness is found as the single universal driver of intentions and value for Mobile VoIP that may be influenced by value proposition design. Thus, an interesting finding is that it is easy to manipulate price perceptions through value propositions, but that this has little effect on intentions, whereas usefulness has a strong effect on intentions but is difficult to influence through value proposition design. This must be considered a dilemma in Mobile VoIP business model design.

For Triple play services the same conclusions can be made about how difficult it is to influence end-users service attribute perceptions through value proposition design. Again, intentions and value are most consistently influenced by variables that are not so much controlled through value proposition design, such as norms and behavioural control. Among the more motivational drivers of intention to use Triple play services we find usefulness, quality and integration to be relevant, but the effect of integration is negative, suggesting that end-users increase their intention to use Triple play services when they are offered as similar to the homogeneous network services they are used to consume. For end-user value, the motivational drivers are usefulness, quality and compatibility, but again, the effects of compatibility corresponds to that of integration for intentions. This leaves us with usefulness and quality as the most important positive drivers of intention and end-user value for Triple play services. We also see that the value proposition design dilemma is the same for Triple play services as for Mobile VoIP.

None of the two services scored high on customer value and intention to adopt the services when compared to previous studies of homogenous network services applying similar sampling principles and measurement instruments. Aggregating findings of important value and intention drivers, we also see that there are similarities in the importance of norms, behavioural control and usefulness. This reflects the simplicity of end-users value and intention models for these two service areas. We also see that "broken causal links" from value proposition design to value and intentions are found for both services, representing a considerable challenge to business model design. The challenge is characterized by difficulties in affecting the value drivers that are important to end-users through (traditional) business model design and ease of affecting service attributes that are of no or little

relevance to end-users' value and adoption. In general it may also be concluded from the set of value drivers identified here that none of them are typical of what may be easily influenced by the characteristics of heterogeneity or convergence. Thus, it is highly unlikely that ordinary end-users, such as those studied here, will be the sources or drivers of heterogeneous network service business model innovation.

Aggregating findings across the business model and end-user studies conducted here we may conclude that business model innovation in heterogeneous network services is not radical. Instead business model deigns apply simple and well-known value propositions, traditional market strategies and known governance forms and revenues models of the same type as those found for homogeneous network services. Incumbent homogeneous network providers do not innovate in business models utilizing heterogeneous network service opportunities, at least not when it comes to services being commercialized.

Regulatory policy is generally seen as innovation friendly, but not innovation oriented. Thus, it doesn't inhibit innovation, but on the other hand, it doesn't actively stimulate innovation either. Current regimes regulate homogenous network service areas and despite being technology neutral, they are not used to stimulate innovation in heterogeneous network services. Established market structures represent a considerable barrier to business model service innovation in heterogeneous network services. Network service markets are complex and simple deregulation do not seem to result in market power restructuring in the same way as that found in other deregulated markets. Thus, dominant players retain their market power through the periods of deregulation and represent barriers to business model innovation in heterogeneous network services. For example, by integrating

vertically into less strictly regulated markets. Technology is still a barrier to heterogeneous network service business model innovation. Whereas standardization is far reaching, the problem lies in practical de-facto standardization, which is influenced by dominant players and by a lack of well developed horizontal governance forms.

Finally, end-user behavior is conservative and value assessments focus well known service attributes of existing homogeneous network services and thus, end-user behaviour represents a barrier to business model innovation in heterogeneous network services.

The conclusions summarized above are based on two studies of business model design and end-user behaviour in the two service areas Mobile VoIP and Triple play. These services were selected as relevant to understanding the developments of and innovations in business model design for heterogeneous network services currently being commercialized. While we argue that the internal validity of the studies is acceptable and that our conclusions thus hold for these two service areas, it may be objected that the service areas are special in ways that limit the external validity of our conclusions. The service areas, however, were selected after careful pre-study (Pedersen et al., 2007) and in collaboration with industry experts. That said, we have found that when it comes to business model innovation, there are more dissimilarities than similarities between the services. This suggests that heterogeneous network services are also “heterogeneous” when it comes to structural conditions, business model designs and end-user behaviour. Of these three elements of our research framework, we found that the two services had most in common on end-user behaviour and least in common on business model designs. Thus, we expect future studies of new heterogeneous network services to reveal the

same pattern of findings for structural and end-user behaviour elements, but show service related particularities when it comes to business model designs. To consider heterogeneous network services as a well defined category of services sharing the same problems and solutions to business model design is thus, difficult.

Despite these limitations, we suggest that our findings have implications to both business model design and to future research on heterogeneous network services. For business model design, the implications are of two types; implications for business model designers, typically provider management, and for policy makers. Business model designers are encouraged to be more radical in their business model innovations. While radical business model designs will not be stimulated by end-user attitudes and structural conditions, more radical business models designs are required to obtain widespread adoption of heterogeneous network services. At the same time, the innovativeness should be exercised in ways that utilizes regulatory policy, windows of unsettled market forces and lack of technological standardization. Some examples may be given along each of the business model design dimensions. For example, value propositions should be clear and communicated firmly to end-users, but innovativeness should be used to increase perceived usefulness, not integration (unless it influences usefulness indirectly) and price advantages. Value propositions should be designed to work with the influence of norms and behavioural control. Thus, segmentation must be used to establish trend-leading behaviour and establish norms, and behavioural control must be increased by offensive trial and test programs. De-facto standardizations should be stimulated by using more horizontal governance forms and completely new revenue models should be tested actively. With respect to revenue models, inspiration may be collected from other deregulated markets, such as Airport development.

To policy makers, our findings imply that business model innovations may not be stimulated by end-user behaviour, and innovativeness may be hindered by established market structures. Thus, deregulation may increase competition on homogeneous network services but is not likely to stimulate heterogeneous network service innovation. To obtain end-user welfare in the long run it is necessary to balance the two objectives of competition and innovation, and these will sometimes counter each other. Regulatory policy must be used to stimulate innovation in heterogeneous network services business models, but this may not be the responsibility of regulatory authorities but of the policy makers that design the regulatory regimes. Deregulation in network markets is complex, and network effects tend to further complicate the relationship between competition, innovation and welfare. Awareness of these issues, particularly the complexities of deregulation effects in heterogeneous network markets resulting from vertical disintegration is particularly important. By adapting regulatory regimes to homogeneous network services markets, innovation in heterogeneous network services may be lost due to, for example, new forms of vertical integration. For example, homogenous network service regulation may cause dominant players to integrate vertically in order to shift market power from a strongly regulated to a less strongly regulated or unregulated market.

Further research may be suggested on both business model issues and end-user behaviour issues from the findings in this study. For business model research, the results from this study encourage further empirical research rather than theoretical research on business model topics. The research framework applied in this study to conduct qualitative interviews may also be extended to quantitative methods enabling more services- and provider comparisons. Among the business model

topics that should be explored further are the lack of consistency between value proposition designs and provider perceptions of relevant end-user attributes. Also, the relationship between vertical and horizontal forms of governance is of interest. The business model studies reported here should also be extended to more service areas and comparisons should be made of results between heterogeneous network services and homogeneous network services.

Further research on end-user behaviour is inspired from the method applied to study value proposition effects developed and applied here. Because only five value proposition manipulations were conducted and only three of those were significant, more operations should be tested. Such tests should also be extended to more service areas, and comparisons between homogeneous network and heterogeneous network services are also interesting in studies of end-user behaviour. The simple adoption and value models identified in this study also indicate that end-user segments should be more carefully investigated to reveal segment differences. This is particularly important because the strong influence of norms and behavioral control suggests that the market strategy dimension of the business model may be a key factor to obtaining widespread adoption of heterogeneous network services.

REFERENCES

Afuah, A. and Tucci, C. L. (2000): *Internet Business Models and Strategies*, McGraw-Hill, Boston.

Ajzen, I. (1991): The Theory of Planned Behavior, *Organization Behavior and Human Decision Processes*, vol. 50, pp. 179-211.

Alcatel (2005): *Operational Excellence in Triple play Service Delivery*, White Paper, Alcatel.

Bain, J. S. (1951): Relation of Profit Rate to Industry Concentration of American Manufacturing, 1936 – 1940, *Quarterly Journal of Economics*, no. 65.

Balasubramanian, S., Peterson, R. A., and Jarvenpaa, S. L. (2002): Exploring the Implications of M-Commerce for Markets and Marketing, *Journal of the Academy of Marketing Science*, vol. 30, pp. 348-361.

Ballon, P. (2004). Scenarios and business models for 4G in Europe. *Info*, 6 (6), 363-382.

Basu, A., Mazumdar, T. and Raj, S.P. (2003). Indirect Network Effects on Product Attributes. Marketing Science, 22, 209-221.

Battacherjee, A. (2000). Acceptance of E-Commerce Services: The Case of Electronic Brokerages. *IEEE Transactions on Systems, Man and Cybernetics*, Vol. 30, pp. 411-420.

Bollen, K.A. (1989). *Structural equations with latent variables.* New York: John Wiley & Sons.

Bolton, R.N. and Drew, J.H. (1991). A multistage model of customers' assessments of service quality and value. *Journal of Consumer Research*, 17, 375-384.

Bouwman, H. (2003): Designing Metrics for Business Models Describing Mobile Services Delivered by Networked Organizations, Presented at *the 16th Bled Electronic Commerce Conference*, Bled, Slovenia, June 9-11.

Brousseau, E. and Quelin, B. (1996): Asset Specificity and Organizational Arrangements: The Case of the New Telecommunication Services Markets, *Industrial and Corporate Change*, vol. 5, pp. 1205-1230.

Bruner, G. C., and Kumar, A. (2000). Web Commercials and Advertisin g Hierarchy-of-Effects, *Journal of Advertising Research*, Vol. 40, Nos. 1&2, pp. 35-42.

Brynjolfson, E. and Kemerer, C. F. (1996): Network Externalities in Microcomputer Software: An Econometric Analysis of the Spreadsheet Market, *Management Science*, vol. 4, pp. 1627-1647.

Byrne, B.M. (2004). Testing for Multigroup Invariance Using AMOS Graphics: A Road Less Traveled . *Structural Equation Modeling: A Multidisciplinary Journal*, 11(2), pp 272 – 300.

Campanovo, G. and Pigneur, Y. (2003): Business Model Analysis Applied to Mobile Business, Presented at *the 5th International Conference on Enterprise Information Systems*, Angers, France, April 23 – 26.

Capgemini (2005): Mobile VoIP: Knocking at the Gates, *Telecom & Media Insights*, Issue 8, March 2005.

Chen Z. and Dubinsky A.J. (2003). A conceptual model of perceived customer value in e-commerce: A preliminary investigation. *Psychology & Marketing*, 20, 323-347.

Chesbrough, H. and Rosenbloom, R.S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. *Industrial and Corporate Change*, 11(3), 529-555.

Chin, W.W. and Gopal, A. (1995). Adoption Intention in GSS – Relative Importance of Beliefs. *Data Base for Advances in Information Systems*, Vol. 26, pp. 42-64.

Cottrell, T. and Koput, K. (1999). Software variety and hardware value: a case study of complementary network externalities in the microcomputer software industry. *Journal of Engineering & Technology Management*, 15, 309-338.

Cronin J.J., Brady M.K. and Hult G.T.M. (2000). Assessing the effects of quality, value, and customer satisfaction on consumer behavioral intentions in service environments. *Journal of Retailing*, 76, 193-218.

Das, T.K. and Teng, B.S. (2000). A Resource-Based Theory of Strategic Alliances. *Journal of Management*, 26(1), 31-61.

Davis, F. D. (1989): Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Computer Technology, *MIS Quarterly*, vol. 13, pp. 319-340.

Davis, F. D., Bagozzi, R. P., and Warshaw, P. R. (1989): User Acceptance of Computer Technology: A Comparison of Two Theoretical Models, *Management Science*, vol. 35, pp. 982-1002.

Doyle, S. (2001): Software Review: Using Short Message Services as a Marketing Tool, *Journal of Database Marketing*, vol. 8, pp. 273-277. s14

Dyer, J.H. and Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23, 660-679.

Finneran. M. (2005). Three Architectures for the Telco Triple play. *Business Communications Review*, March, 32-37.

Fishbein, M. and Ajzen, I. (1975): Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Addison-Wesley, Reading MA.

Frels, J.K., Shervani, T. and Srivastave, R.K. (2003). The Integrated Networks Model: Explaining Resource Allocations in Network Markets. *Journal of Marketing*, 67, 29-45.

Gallaugher, J.M. and Wang. Y.M. (2002). Understanding Network Effects in Software Markets: Evidence from Web Server Pricing. *MIS Quarterly*, 26, 303-327.

Gandal, N., Kende, M, and Rob, R. (2000). The dynamics of technological adoption in hardware/software systems: the case of compact disc players. *RAND Journal of Economics*, 31, 43-61.

Ghosh, M. and John, G. (1999). Governance Value Analysis and Marketing Strategy. *Journal of Marketing*, 63, 131-145.

Gibson, J. F., Bilderbeek, P., and Vestergaard, L. (2005): *Fixed-Mobile Convergence: Unifying the Communication Experience*, An IDC White Paper, November,

Godø, H. (2000). Innovation regimes, R&D and radical innovations in telecommunications. *Research Policy* 29, 1003-1046.

Godø, A. and Henten, A. (2008). *Structural conditions for business model design in new information and communication services – A case study of multi-play and MVoIP in Denmark and Norway*. SNF Working paper, Institute for Research in Economics and Business Administration, Bergen, Norway.

Grewal, D., Monroe, K.B. and Krishnan, R. (1998). The effects of price-comparison advertising on buyers' perceptions of acquisition value, transaction value, and behavioral intentions. *Journal of Marketing*, 62, 46-59.

Gupta, S., Jain, D.C., Sawhney, M.B. (1999). Modeling the Evolution of Markets with Indirect Network Externalities: An Application to Digital Television. *Marketing Science*, 18, 396-416.

Hagen, K.P and Nafstad, A. (2003). *Telepolitikk i Europa*. SNF-Report nr. 27/03. Institute for Research in Economics and Business Administration, Bergen, Norway.

Hair, J.F., Anderson, R.E., Black, W.C. and Tatham, R.L. (2006). *Multivariate Data Analysis*. Prentice Hall, New York.

Henten, A., Olesen, H, Saugstrup, D and Tan, S.E. (2004). Moile communications: Europe, Japan and South Korea in a comparative perspective. *Info*, 6(3), 197-207.

Hommen, L. (2003). The Universal Mobile Telecommunications System (UMTS). In C. Edquist (ed). *The Internet and Mobile Telecommunications System of Innovation* Edward Elgar, Cheltenham, pp. 129-161.

Hong, S. - J. and Tam, K. Y. (2006). Understanding the Adoption of Multipurpose Information Appliances: The Case of Mobile Data Services, *Information Systems Research*, Vol. 17, No. 2, pp. 162-179.

Hui, S.Y. and Yeung, K.H. (2003). Challenges in the migration to 4G mobile systems. *IEEE Communications Magazine*, 41 (12): 54-59.

IBM (2006): *The End of Television as We Know it. A Future Industry Perspective*, IBM Institute for Business Value, Somers, NY.

Intel (2006). The Business Case for Enterprise VoIP. Intel White Paper. February. Intel Corp., US.

Joreskog, K.G., & Sorbom, D. (1993). LISREL 8 user's reference guide. Chicago: Scientific Software International, Inc.

Kadiyali, V., Sudhir, K. and Rao, V.R. (2001). Structural analysis of competitive behavior: New Empirical Industrial Organization methods in marketing. *International Journal of Research in Marketing*, 18: 161.186.

Khalifa, M. and Shen, K. N. (2008). Drivers for Transactional B2C M-Commerce Adoption: Extended Theory of Planned Behavior, *The Journal of Computer Information Systems*, Vol.48, No. 3, pp. 111-117.

Kannan, P. K., Mei Chang, A.-M., and Whinston, A. B. (2001). Wireless Commerce: Marketing Issues and Possibilities, *Proceedings of the 34th Hawaii International Conference on System Sciences*, pp. 1-6.

Kim, H.W., Chan, H.C. and Gupta, S. (2007). Value-based Adoption of Mobile Internet: An empirical investigation. *Decision Support Systems* No. 43, pp. 111 –126.

Koutsopoulou, M. Kaloxylos, A., Alonistioti, A., Merakos, L. and Philippopoulos, P. (2004). An integrated charging, accounting and billing management platform for the support of innovative business models in mobile networks. *International Journal of Mobile Communications*, 2(4), 418 - 434

Lee, Y. and O'Connor, G.C. (2003). New Product Launch Strategy for Network Effects Products. *Journal of the Academy of Marketing Science*, 31, 241-255.

Lee, Y.-C. (2006). An Empirical Investigation into Factors Influencing the Adoption of an E-learning System, *Online Information Review*, Vol. 30, No. 5, pp. 517-541.

Liebowitz, S. and Margolis, S. (1998). Network Externality. In *The New Palgraves Dictionary of Economics and the Law*, MacMillan, UK.

Lin, C.A. & Atkin, D.J. (2002). *Communication Technology and Society*. Hampton Press, NJ.

Lindmark, Sven, Pieter Ballon, Collin Blackman, Erik Bohlin, Simon Forge and Uta When (2006). Alternative wireless technologies – trends, drivers and European policy. *Proc. EuroCPR 2006*. 26-28 March, Sevila, Spain.

Luo, L., Liu, J., Shao, L., Lu, W. and Ye, M. (206): A context-aware smart-call-center solution: Improving customer service for online games, *IBM Systems Journal*, vol. 45, no. 1, pp. 145-160.

Malone, T.W., Weill, P.,Lai, R.K., D'Urso, V.T., Herman, G., Apel, T.G., Woerner, S.L. (2006). Do Some Business Models Perform Better than Others?, MIT Sloan Working Paper 4615-06.

Mathwick, C., Malhotra, N. and Rigdon, E. (2001). Experiential value: conceptualization, measurement and application in the catalog and Internet shopping environment. *Journal of Retailing*, 77, 39-56.

Mathieson, K. (1991). Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*. Vol. 2, pp. 173-191.

Methlie, L.B. and Gressgård, L.J. (2004). Mobile Data Service Markets: Structural Market Antecedents to Business Model Choices. *Journal of Electronic Commerce Research*, 7(1), 14-26.

Methlie, L.B. and Pedersen, P.E. (2002). A taxonomy of intermediary integration strategies in online markets. Presented at the15th Bled Electronic Commerce Conference, Bled, Slovenia, June 17-19.

Methlie, L.B. and Pedersen, P.E. (2007). Business Model Choices for Value Creation of Mobile Services. *Info - The journal of policy, regulation and strategy for telecommunications*, Vol. 9, No. 4, pp. 70-85.

Moore, G. C. and Benbasat, I. (1991): Development of an Instrument to Measure the Perception of Adopting and Information Technology Innovation, *Information Systems Research*, vol. 2, no. 3, pp. 192-222.

Nambisan S. (2002). Complementary product integration by high-technology new ventures: The role of initial technology strategy. *Management Science*, 48, 382-398.

Nicholls-Nixon, C. L. and Wood, C. (2003): Technology Sourcing and Output of Established Firms in a Regime of Encompassing Technological Change, *Strategic Management Journal*, vol. 24, pp. 651-666.

Nordman, J. and Liljander, V. (2003). Mobile Service Quality – A Study of Contributing Factors. Working Paper, Marketing Dep., Hanken Swedish School of Economics and Business Administration, Helsinki, Finland.

NPT (2006). *Regulering avd bredbåndstelefoni etter lov om elektronisk kommunikasjon*. Rapport av 14. juni, Post og teletilsynet, Oslo, Norway.

Nysveen, H. and Pedersen, P.E. (2004). An exploratory study of customers' perception of company web sites offering various interactive applications: Moderating effects of customers' Internet experience. *Decision Support Systems*, vol. 37, pp. 137-150.

Nysveen, H., Pedersen, P. E., and Thorbjørnsen, H. (2005): Intentions to Use Mobile Services: Antecedents and Cross-Service Comparisons, *Journal of the Academy of Marketing science*, vol. 33, no. 3, pp. 330-346.

Okamoto, Y. and Reynolds, T. (2006). *Multiple Play: Pricing and Policy Trends.* Report JT03207142 of the Directorate for Science, Technology and Industry, OECD.

Osterwalder, A., Pigneur, Y., Ondrus, J. and Lathoud, B. 2005a. *Skype's disruptive potential in the telecom market: a systematic comparison of business models*. Working paper, University of Lousanne, Switzerland.

Osterwalder, A, Pigneur, Y. and Tucci, C.L. 2005b. Clarifying business models: origins, present, and future of the concept. *Comm. AIS*, 16(1).

Papacharissi, Z. and Rubin, A. M. (2000): Predictors of Internet Use, *Journal of Broadcasting and Electronic Media*, vol. 44, pp. 175-196.

Pedersen, P.E., Methlie, L.B., Nysveen, H., Gjerde, I. Godø. H, Henten, A., Ling, R., Oleshchuk, V. and Reichert, F. (2007). *Structural conditions, business models and customer value in heterogeneous network services – A pre-study of five service areas.* SNF Report No 02/07. Institute for Research in Economics and Business Administration, Bergen, Norway.

Petrick, J.F. (2002). Development of a multi-dimensional scale for measuring the perceived value of a service. *Journal of Leisure Research*, 34, 119-134.

Porter, M.E. (1991). Towards a Dynamic Theory of Strategy, *Strategic Management Journal*, 12, 95-117

Reding, V. (2006). *From Service Competition to Infrastructure Competition: the Policy Options Now on the Table*. ECTA Conference, Brussels, November, 16.

Rogers, E. M. (1995): *Diffusion of Innovations* (4th Edition), The Free Press, New York. s64

Schilling, M. A. (2003): Technological Leapfrogging: Lessons from the US Video Game Console Industry, *California Management Review*, vol. 45, pp. 6-32.

Sekino, H., Pecorari, M., Douglas, G., and Gates, D. (2006): *Convergence: One Size Doesn't Fit All*, Diamond Management & Technology Consultants, Chicago, IL.

Sengupta, S. (1998): Some Approaches to Complementary Product Strategy, *Journal of Product Innovation Management*, vol. 15, pp. 352-367.

Simon, M. (2005): *Overview of the Current Situation of Voice over Internet Protocol*, Computing Research Methods Report, Semester 2, 2005 (3 November), School of Computer and Information Science, University of South Australia.

Stuart, T. E. (2000). Interorganizational Alliances and the Performance of Firms: A Study of Growth and Innovation Rates in a High-Technology Industry, *Strategic Management Journal*, vol. 21, pp. 791-811.

Sweeney, J.C. and Soutar, G.N. (2001). Consumer perceived value: the development of a multi item scale. *Journal of Retailing*, 77, 203-220.

Tachikawa K. (2003). A perspective on the evoulition of mobile communications. IEEE *IEEE Communications Magazine*, 41 (10): 66-73.

Taylor, S. and Todd, P.A. (1995). Understanding information technology usage: a test of competing models. *Information Systems Research*, Vol. 6, pp. 144-176.

Thorbjørnsen, H., Pedersen, P.E. and Nysveen, H. (2008). Categorizing networked services: The role of intrinsic, user network and complement network attributes. Accepted for publication in *European Journal of Marketing*.

Timmers, P. (1998): Business Models for E-Commerce, *Electronic Markets*, vol. 8, pp. 3-7.

Tobin, P. K. J. and Bidoli, M. (2006): Factors affecting the adoption of voice over internet protocol (VoIP) and other converged IP services in South Africa, *South Africa Journal of Business Management*, vol. 37, no. 1, pp. 31-40.

Ure, J. (2003). Deconstructing 3G and reconstructing telecoms. *Telecommunications Policy*, 27, 187-206.

Venkatesh V. and Davis, F.D. (2000). A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*, Vol. 46, 186-204

Venkatesh,V. Morris, M.G., Davis, G.B. and Davis F.D. (2003). User Acceptance Of Information Technology, Toward A Unified View, MIS Quarterly, Vol. 27, No. 3, pp. 425-478.

Vesa, J. (2003): The Impact of Industry Structure, Product Architecture, and Ecosystems on the Success of Mobile Data Services: A Comparison Between European and Japanese Markets, Presented at *the ITS 14th European Regional Conference*, Helsinki, Finland, August 23-24.

Voss, D., Parasuraman, A., and Grewal, G.B. (1998). The Roles of Price, Performance, and Expectations in Determining Satisfaction in Service Exchanges, *Journal of Marketing*, October, pp. 46-61.

Wang, C.-C., Hsu, Y. H., and Fang, W. (2005): Acceptance of Technology with Network Externalities: An Empirical Study of Internet Instant Messaging

Services, *Journal of Information Technology Theory and Application*, vol. 6, no. 4, pp. 15-28.

Watson, R. T., Pitt, L. F., Berthon, P., and Zinkhan, G. M. (2002): U-Commerce: Expanding the Universe of Marketing, *Journal of the Academy of Marketing Science*, vol. 30, pp.333-347.

Weill, P. and Vitale, M. R. (2001): *Place to Space. Migrating to e-business Models*, Harvard Business School Press, Boston, MA.

Williamson, O.E. (1985) *The Economic Institutions of Capitalism*. The Free Press, New York.

Wu, J. - H. and Wang, S. - C. (2005). What Drives Mobile Comerce? An Empirical Evaluation of the Revised Technology Aceptance Model, *Information & Management*, Vol. 42, pp. 719-729.

Xu, D. J. (2006-2007). The Influence of Personalization in Affecting Consumer Attitudes toward Mobile Advertising in China, *Journal of Computer Information Systems*, Winter, pp. 9-19.

Yin, R.K. (1981) The Case Study Crisis. Some Answers, *Administrative Science Quarterly,* 26, pp. 58-65.

Yin, R.K. (1984) *Case Study Research: Design and Methods*, Sage Publications, Beverly Hills.

Zahra, S. A. and Nielsen, A. P. (2002): Sources of Capabilities, Integration and Technology Commercialization, *Strategic Management Journal*, vol. 23, pp. 377-398. s14

Zhang, J., Chan, S., and Fang, X. (2004). *Enterprise User Adoption of VoIP,* working paper, DePaul University, School of Computer Science, Telecommunications and Information Systems, Chicago, IL.

Zeithaml, V.A. (1988). Consumer Perceptions of Price, Quality and Value: A Means-End Model and Synthesis of Evidence. *Journal of Marketing*, Vol.52, pp. 2-22.

Zeithaml, V.A., Parasuraman, A. and Malhotra, A. (2002). Service quality delivery through web sites: a critical review of extant knowledge. *Journal of the Academy of Marketing Science*, 30, 362-375.

APPENDIX A. Triple play and Mobile VoIP interview findings

Summary Table **Relevant factors extracted from interview transcripts**		
Strategy dimensions	**Triple/Multi play**	**Mobile VOIP**
Business model *Value proposition	*Current Drivers* *Convenience - simplicity *Competitiveness - bundling *Interactivity (digital return channel) *Increased functionality *User-generated content *Peer-to-peer services *Time and place shifting *Less customer retention *Uniqueness Characteristics* *ADSL: Large installed customer base *Fiber: High capacity (100 Mbps); Symmetric; Multi play *Fiber – closed platforms: Simplicity; Secure cash flow and profitability *Fiber – open platforms: Greater service variety; Competitive; Lower prices; Innovative *Current impediments* *Limitations on IP protocols *Lack of standardization *Cannibalization *Future Drivers* *Symmetric services *New terminals adapted to social setting *Integration of mVoIP *From triple to quad to Multi	*Reduced price/costs *Predictable costs *Possibility for higher voice quality *One number

	play *VDSL2	
*Market strategy	*Market development* *Reduced price/capacity-ratio *Sustainable business model *Critical mass important *Developing customer base through: -Partnership -Associations -Broad (unfocused) strategies -Energy companies use their existing energy customer base -Content providers addresses the two-sided market with different value propositions -Changing demand patterns *Market segmentation* *Demographics (age, gender) *Economics *Lifestyle (Preferences, interests, etc.) *Market channels* *Universities, companies *Cooperatives - co-ownerships *Co-branding:* service providers; Media houses	*Business market today – all market in the future *Customer support is important
*Governance form	*Vertical Integration* *Integration objectives: -Competence transfer -Technology transfer -Risk sharing -Financing -Gain cost effectiveness -Negotiation power -Quality of service guaranties (quality,	*We do not see network models – as expected *Some cooperation do find place

	capacity, stability) *Integration forms: -Closed service delivery platforms -Open service delivery platforms -Repositioning -Cooperation -Co-financing of content -Ownerships -Contractual agreements -Mergers *Horizontal Integration* *Geograph. partnerships *Innovation partnerships *Multi access platforms	
*Revenue model and costs	*Revenue Sources* *Advertising *Subscription *Sponsorships *End user payments *Increased capacity demand *Revenue appropriation* *Open platforms: Service provider sharing with distributor *Other platforms: platform owner (distributor) sharing with service provide *Top line (ARPU) substituted by bottom line (APU) *Costs* *Production *Distribution rights *Platform operator costs	*Build customer base – exit *Revenue from value-added services on top of Mobile VoIP *Revenue from termination *Possible to earn money on lower arpu for MVNOs *Flat fee subscription *Costs related to start-up, network charges (physical net), billing systems, media gateway, etc *Relevant revenue and costs is moderated by type of actor (incumbent or MVNO)
Structural conditions *Regulation	*Significant market power constrains behavior *General access regulation (technology neutrality) *Infrastructure vs. service	*Relevant regulators are PT, the Data Inspectorate, and some Ministries

	regulation *More regulation transferred to the competition authorities *Content providers want less restriction on advertising	*PT allows the largest actors to have (too) much market power *Regulating authorities ensure status quo rather than innovation *Call origination required for emergency numbers *Different regulating conditions in different markets (countries) is a challenge
*Market and competition	*Market pricing *Battle for the customer interface *Horizontal market segmentation on fiber *Fiber takes market shares *Fiber – cable competition *Access technology competition *Technology neutral prices *Cross-pricing: energy - tele *Cross-selling: energy utilities *Owner based customers (energy utilities - municipalities) *Many players loosing money	*A few large actors dominate the market *The incumbents will be challenged more and more the next few years
*Technology	*New standards: MPEG 4 and VDSL2 *New terminal equipment *Upgrading of network electronics *Do not believe on Windows Media *PON developments	*All future communication will be IP based (SIP beats UMA) *Lack of standardization today *Few devices for Mobile VoIP today
Service attributes *Intrinsic attributes	*Price *Freedom of choice vs.	*Lower price

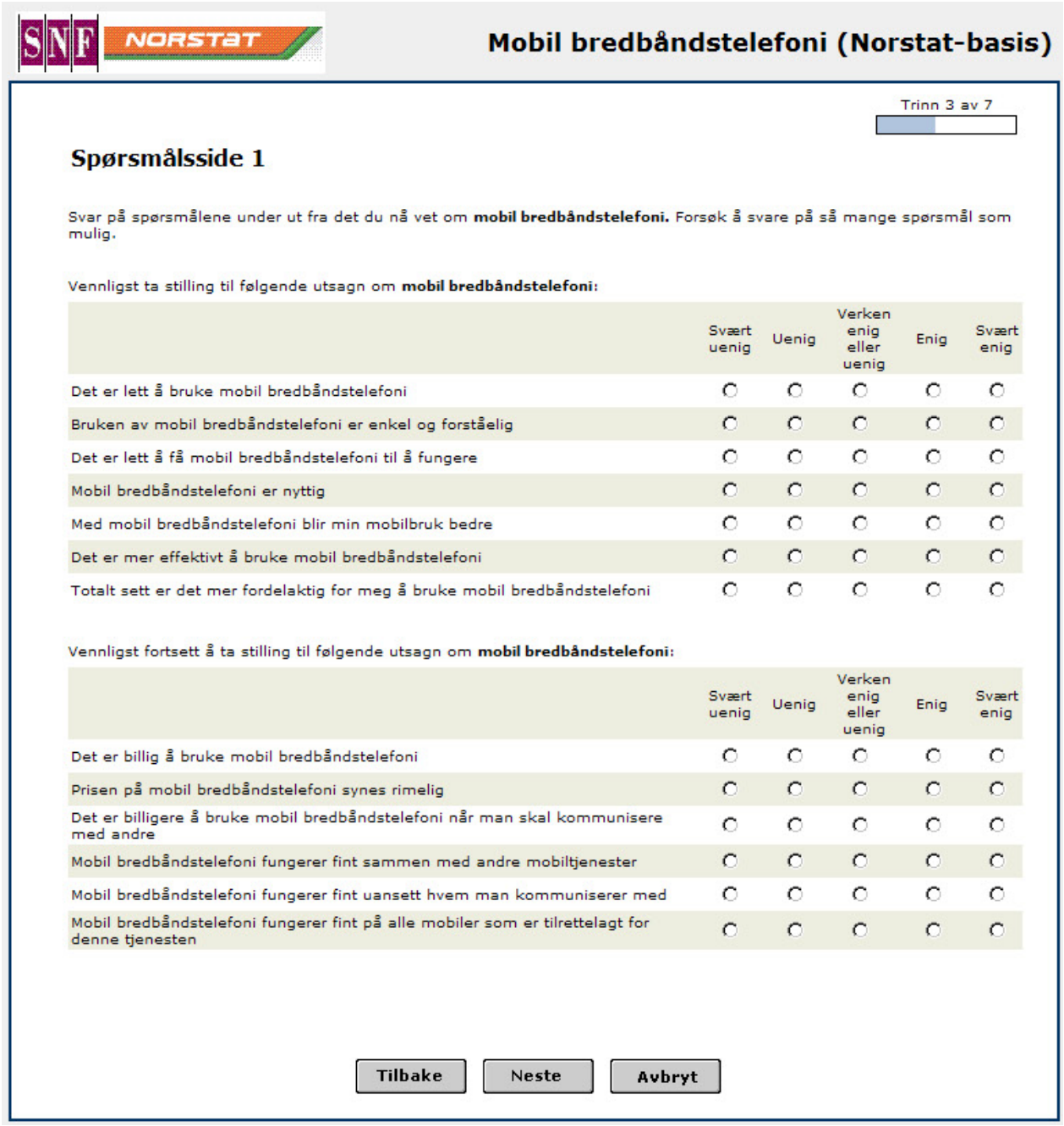
	packaging *Quality (networks and services) *Brand associations *User friendliness *Customer service (service provider - operator)	*Value added services *More options *To succeed, it is important that calls are automatically set up at a lowest price and that the services are user friendly (both to set-up and to use)
*User network attributes	*Community sites with own brands *Reluctance to communities due to privacy issues	*Depending on the perspective, Mobile VoIP may limit or extend consumers' network
*Complement network attributes	*Number of viewers (users) important *Complementary channels *Quality of complementary channels	*Presence *Video *Chat *Voicemail *Integration of contacts (e.g. with Facebook) *Etc.

APPENDIX B. Script elements manipulated and video links

Service	Attribute	Script element	YouTube ID (*)	N
M. VoIP	Convenience	Seamless handover, convenience text	plbxPLK0geo	54
M. VoIP	Integration	IM service integration (MSN, GoogleTalk, ICQ etc.)	eAc8WpkE_n4	51
M. VoIP	Cost	International and infrequent call costs, free used in text	mm9oI6kbIzU	49
M. VoIP	User netw.	Calls to pure-IP services (Skype, GoggleTalk etc.)	WtN3WWLWNUI	45
M. VoIP	Comp. netw.	Map and Facebook calls + comp. service increase	GOOtfX8rExc	46
M-play	Convenience	One cable, one bill, convenience text	SH-K64vHW0E	52
M-play	Integration	Call on TV during movie, movie follows user terminal	dBs2D8aEhE8	49
M-play	Cost	Lower costs, rebates, one service free used in text	k4ij0t4B9P8	54
M-play	User netw.	Calls to pure-IP services (Skype, GoggleTalk etc.)	XVneshFAPBQ	50
M-play	Comp. netw.	Comp. service increase + open network illustration	64e9K5jwVsQ	48

(*) Links to videos are generated by pasting “http://www.youtube.com/watch?v=” into the browser window and appending the YouTube ID.

APPENDIX C. Measurement instrument



SNF NORSTAT

Mobil bredbåndstelefoni (Norstat-basis)

Trinn 3 av 7

Spørsmålsside 1

Svar på spørsmålene under ut fra det du nå vet om **mobil bredbåndstelefoni.** Forsøk å svare på så mange spørsmål som mulig.

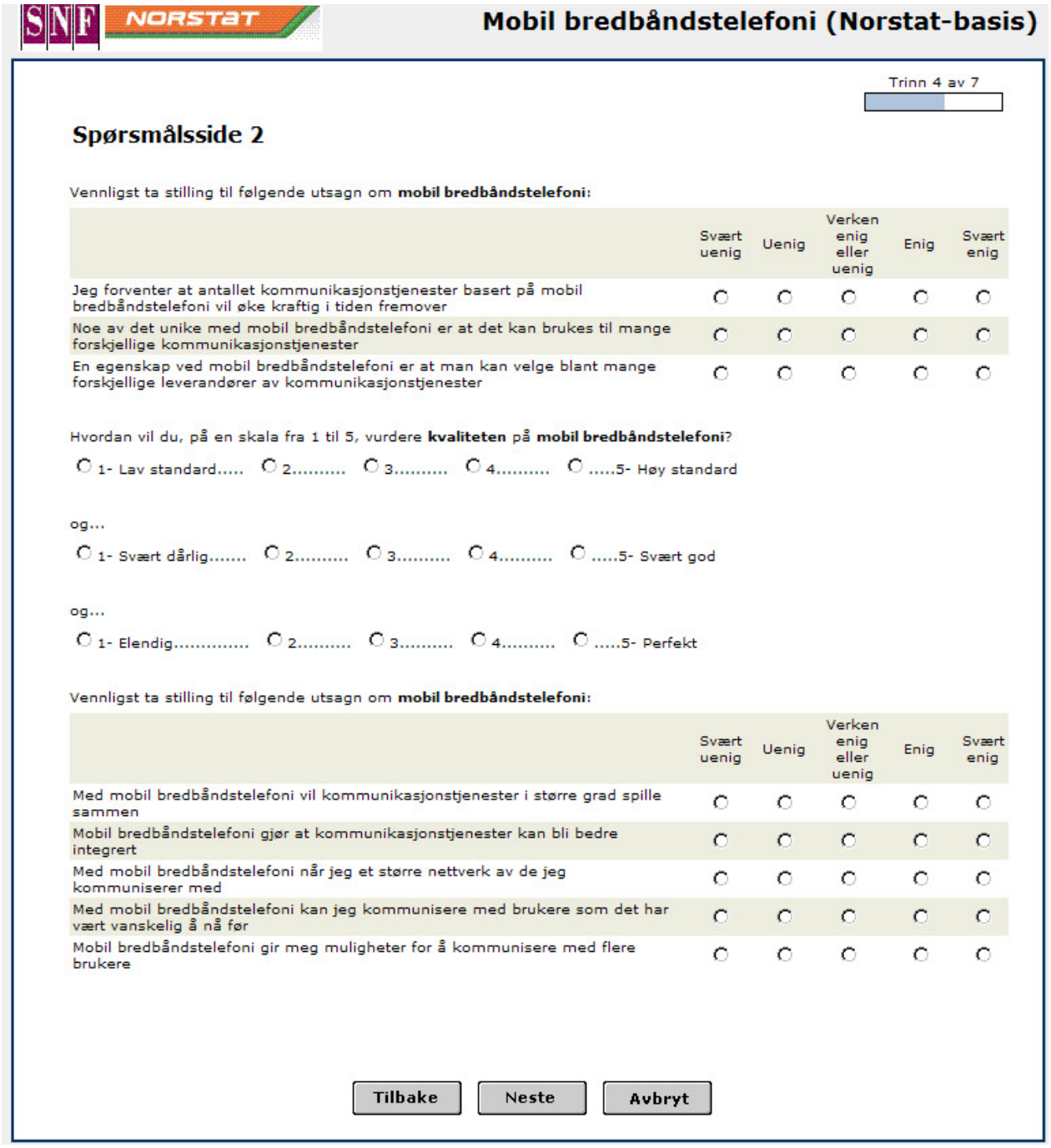
Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Det er lett å bruke mobil bredbåndstelefoni	○	○	○	○	○
Bruken av mobil bredbåndstelefoni er enkel og forståelig	○	○	○	○	○
Det er lett å få mobil bredbåndstelefoni til å fungere	○	○	○	○	○
Mobil bredbåndstelefoni er nyttig	○	○	○	○	○
Med mobil bredbåndstelefoni blir min mobilbruk bedre	○	○	○	○	○
Det er mer effektivt å bruke mobil bredbåndstelefoni	○	○	○	○	○
Totalt sett er det mer fordelaktig for meg å bruke mobil bredbåndstelefoni	○	○	○	○	○

Vennligst fortsett å ta stilling til følgende utsagn om **mobil bredbåndstelefoni:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Det er billig å bruke mobil bredbåndstelefoni	○	○	○	○	○
Prisen på mobil bredbåndstelefoni synes rimelig	○	○	○	○	○
Det er billigere å bruke mobil bredbåndstelefoni når man skal kommunisere med andre	○	○	○	○	○
Mobil bredbåndstelefoni fungerer fint sammen med andre mobiltjenester	○	○	○	○	○
Mobil bredbåndstelefoni fungerer fint uansett hvem man kommuniserer med	○	○	○	○	○
Mobil bredbåndstelefoni fungerer fint på alle mobiler som er tilrettelagt for denne tjenesten	○	○	○	○	○

Tilbake Neste Avbryt



SNF NORSTAT

Mobil bredbåndstelefoni (Norstat-basis)

Trinn 4 av 7

Spørsmålsside 2

Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni**:

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Jeg forventer at antallet kommunikasjonstjenester basert på mobil bredbåndstelefoni vil øke kraftig i tiden fremover	○	○	○	○	○
Noe av det unike med mobil bredbåndstelefoni er at det kan brukes til mange forskjellige kommunikasjonstjenester	○	○	○	○	○
En egenskap ved mobil bredbåndstelefoni er at man kan velge blant mange forskjellige leverandører av kommunikasjonstjenester	○	○	○	○	○

Hvordan vil du, på en skala fra 1 til 5, vurdere **kvaliteten** på **mobil bredbåndstelefoni**?

○ 1- Lav standard..... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Høy standard

og...

○ 1- Svært dårlig..... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Svært god

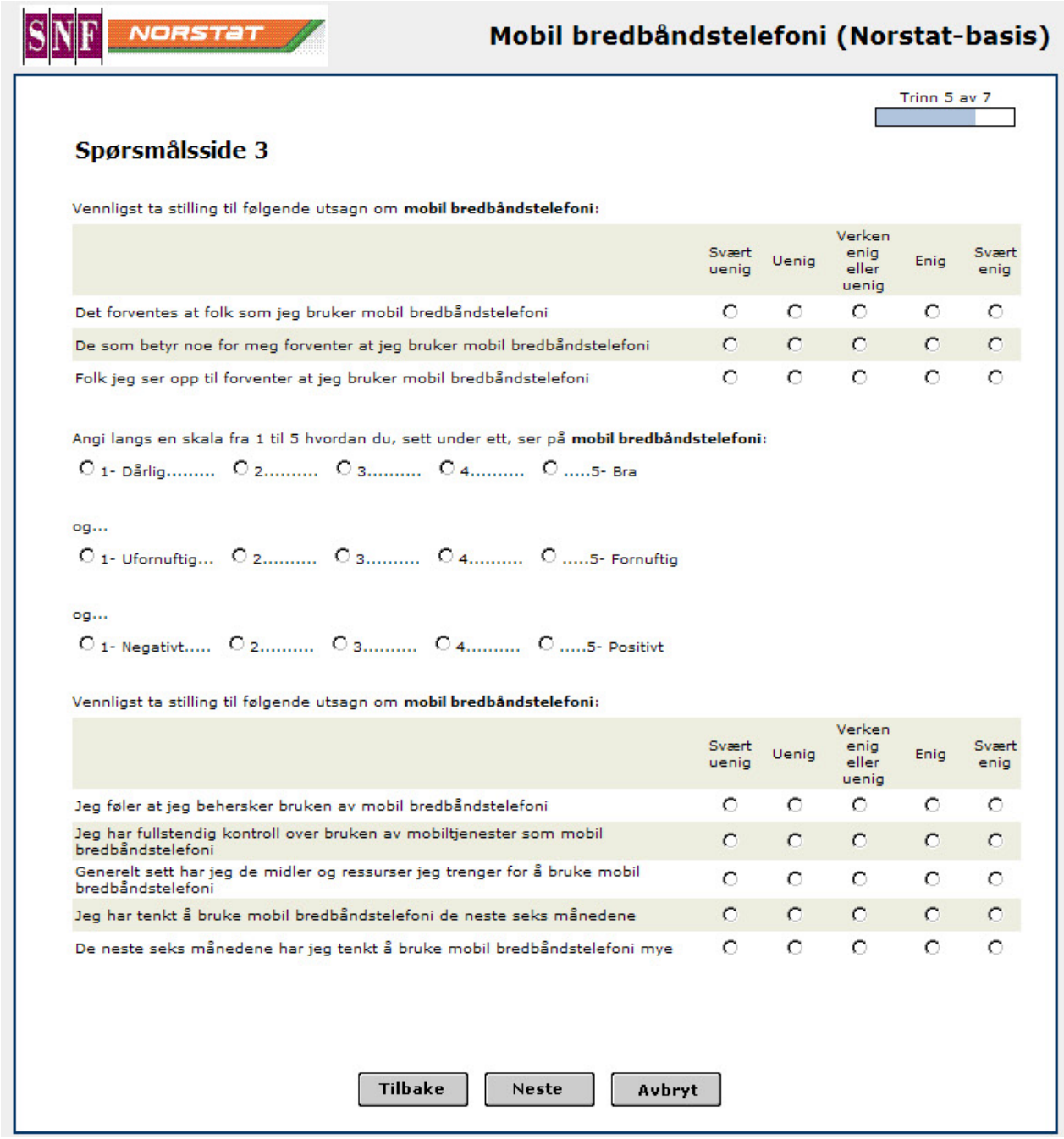
og...

○ 1- Elendig..... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Perfekt

Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni**:

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Med mobil bredbåndstelefoni vil kommunikasjonstjenester i større grad spille sammen	○	○	○	○	○
Mobil bredbåndstelefoni gjør at kommunikasjonstjenester kan bli bedre integrert	○	○	○	○	○
Med mobil bredbåndstelefoni når jeg et større nettverk av de jeg kommuniserer med	○	○	○	○	○
Med mobil bredbåndstelefoni kan jeg kommunisere med brukere som det har vært vanskelig å nå før	○	○	○	○	○
Mobil bredbåndstelefoni gir meg muligheter for å kommunisere med flere brukere	○	○	○	○	○

Tilbake Neste Avbryt



SNF NORSTAT

Mobil bredbåndstelefoni (Norstat-basis)

Trinn 5 av 7

Spørsmålsside 3

Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Det forventes at folk som jeg bruker mobil bredbåndstelefoni	○	○	○	○	○
De som betyr noe for meg forventer at jeg bruker mobil bredbåndstelefoni	○	○	○	○	○
Folk jeg ser opp til forventer at jeg bruker mobil bredbåndstelefoni	○	○	○	○	○

Angi langs en skala fra 1 til 5 hvordan du, sett under ett, ser på **mobil bredbåndstelefoni:**

○ 1- Dårlig..... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Bra

og...

○ 1- Ufornuftig... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Fornuftig

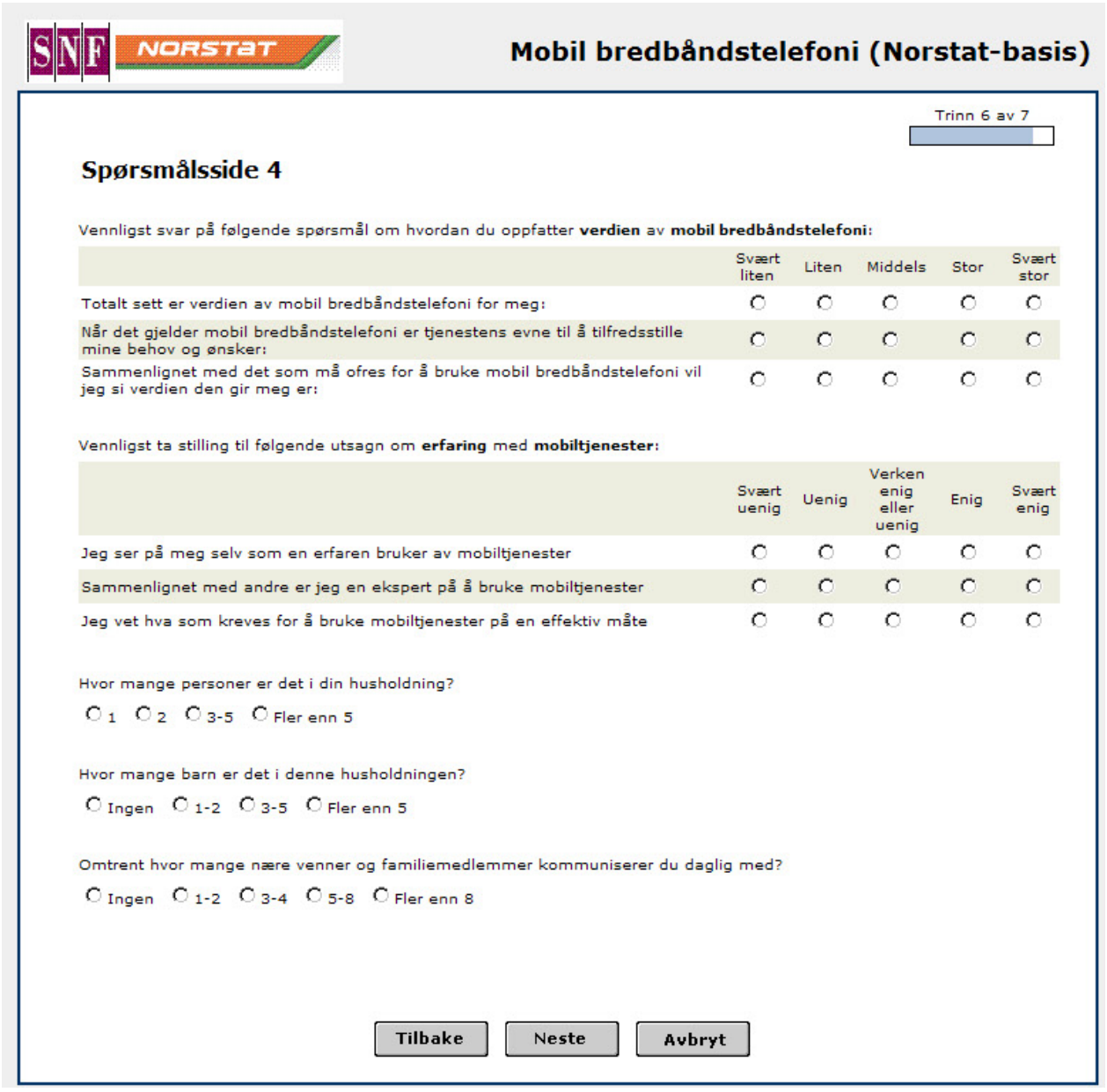
og...

○ 1- Negativt..... ○ 2..... ○ 3..... ○ 4..... ○ .....5- Positivt

Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Jeg føler at jeg behersker bruken av mobil bredbåndstelefoni	○	○	○	○	○
Jeg har fullstendig kontroll over bruken av mobiltjenester som mobil bredbåndstelefoni	○	○	○	○	○
Generelt sett har jeg de midler og ressurser jeg trenger for å bruke mobil bredbåndstelefoni	○	○	○	○	○
Jeg har tenkt å bruke mobil bredbåndstelefoni de neste seks månedene	○	○	○	○	○
De neste seks månedene har jeg tenkt å bruke mobil bredbåndstelefoni mye	○	○	○	○	○

Tilbake Neste Avbryt



SNF NORSTAT

Mobil bredbåndstelefoni (Norstat-basis)

Trinn 6 av 7

Spørsmålsside 4

Vennligst svar på følgende spørsmål om hvordan du oppfatter **verdien** av **mobil bredbåndstelefoni:**

	Svært liten	Liten	Middels	Stor	Svært stor
Totalt sett er verdien av mobil bredbåndstelefoni for meg:	○	○	○	○	○
Når det gjelder mobil bredbåndstelefoni er tjenestens evne til å tilfredsstille mine behov og ønsker:	○	○	○	○	○
Sammenlignet med det som må ofres for å bruke mobil bredbåndstelefoni vil jeg si verdien den gir meg er:	○	○	○	○	○

Vennligst ta stilling til følgende utsagn om **erfaring** med **mobiltjenester:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Jeg ser på meg selv som en erfaren bruker av mobiltjenester	○	○	○	○	○
Sammenlignet med andre er jeg en ekspert på å bruke mobiltjenester	○	○	○	○	○
Jeg vet hva som kreves for å bruke mobiltjenester på en effektiv måte	○	○	○	○	○

Hvor mange personer er det i din husholdning?

○ 1 ○ 2 ○ 3-5 ○ Fler enn 5

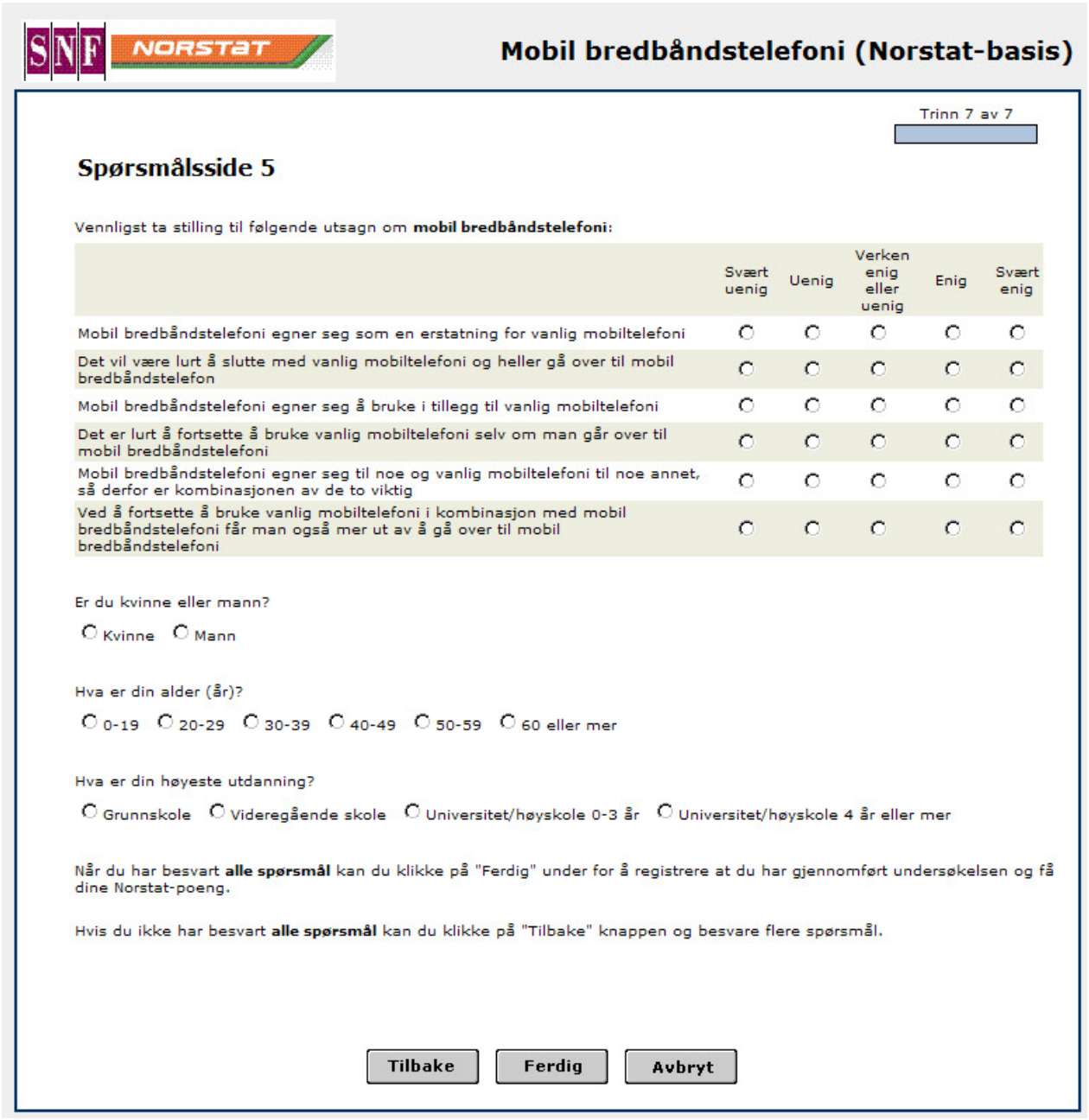
Hvor mange barn er det i denne husholdningen?

○ Ingen ○ 1-2 ○ 3-5 ○ Fler enn 5

Omtrent hvor mange nære venner og familiemedlemmer kommuniserer du daglig med?

○ Ingen ○ 1-2 ○ 3-4 ○ 5-8 ○ Fler enn 8

Tilbake Neste Avbryt



SNF NORSTAT

Mobil bredbåndstelefoni (Norstat-basis)

Trinn 7 av 7

Spørsmålsside 5

Vennligst ta stilling til følgende utsagn om **mobil bredbåndstelefoni:**

	Svært uenig	Uenig	Verken enig eller uenig	Enig	Svært enig
Mobil bredbåndstelefoni egner seg som en erstatning for vanlig mobiltelefoni	○	○	○	○	○
Det vil være lurt å slutte med vanlig mobiltelefoni og heller gå over til mobil bredbåndstelefon	○	○	○	○	○
Mobil bredbåndstelefoni egner seg å bruke i tillegg til vanlig mobiltelefoni	○	○	○	○	○
Det er lurt å fortsette å bruke vanlig mobiltelefoni selv om man går over til mobil bredbåndstelefoni	○	○	○	○	○
Mobil bredbåndstelefoni egner seg til noe og vanlig mobiltelefoni til noe annet, så derfor er kombinasjonen av de to viktig	○	○	○	○	○
Ved å fortsette å bruke vanlig mobiltelefoni i kombinasjon med mobil bredbåndstelefoni får man også mer ut av å gå over til mobil bredbåndstelefoni	○	○	○	○	○

Er du kvinne eller mann?

○ Kvinne ○ Mann

Hva er din alder (år)?

○ 0-19 ○ 20-29 ○ 30-39 ○ 40-49 ○ 50-59 ○ 60 eller mer

Hva er din høyeste utdanning?

○ Grunnskole ○ Videregående skole ○ Universitet/høyskole 0-3 år ○ Universitet/høyskole 4 år eller mer

Når du har besvart **alle spørsmål** kan du klikke på "Ferdig" under for å registrere at du har gjennomført undersøkelsen og få dine Norstat-poeng.

Hvis du ikke har besvart **alle spørsmål** kan du klikke på "Tilbake" knappen og besvare flere spørsmål.

Tilbake Ferdig Avbryt

PUBLICATIONS WITHIN SNF'S TELE AND MEDIA ECONOMICS PROGRAM 2008-

Per E. Pedersen
Leif B. Methlie
Herbjørn Nysveeen
An exploratory study of business model design and customer value in heterogeneous network services
SNF Report No 09/08, Bergen

Hans Jarle Kind
Tore Nilssen
Lars Sørgard
Business models for media firms: Does competition matter for *how they raise revenue?*
SNF Working Paper No 21/08, Bergen

Helge Godø
Anders Henten
Structural conditions for business model design in new information and communication services – A case study of multi-play and MVolP in Denmark and Norway
SNF Working Paper No 16/08, Bergen

Hans Jarle Kind
Marko Koethenbuerger
Guttorm Schjelderup
On revenue and welfare dominance of ad valorem taxes in two-sided markets
SNF Working Paper No 08/08, Bergen

Øystein Foros
Kåre P. Hagen
Hans Jarle Kind
Price-dependent profit-shifting as a channel coordination device
SNF Working Paper No 05/08, Bergen

Hans Jarle Kind
Marko Koethenbuerger
Guttorm Schjelderup
Efficiency enhancing taxation in two-sided markets
SNF Working Paper No 01/08, Bergen